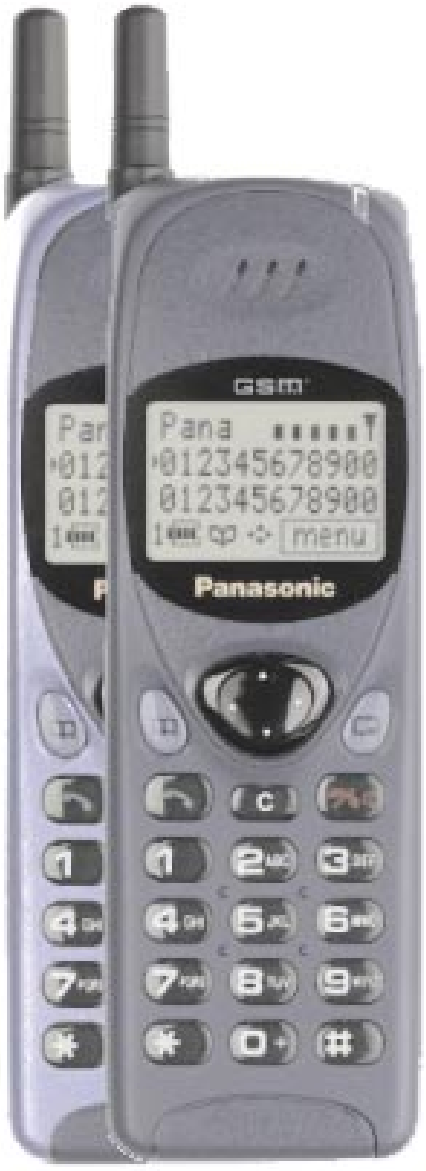
r er u ber MCUK970901C8

Service Manual

G450 ersonal Cellular Telephone

an hel ortable
EB-G450
Car Mount Kit
EB-HF501Z
Easy it Car Mount Kit
EB-HF450Z
Si ple Car Kit
EB-KD500
C A aptor
EB-CD400A
ual Charger
EB-CR500



Panasonic
GSM

Issue 1
Revision 0

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WARNINGS AND CAUTIONS

WARNING

The e uip ent escribe in this anual contains polarise capacitors utilising li ui electrolyte These evices are entirely sa e provi e that neither a short-circuit nor a reverse polarity connection is a e across the capacitor ter inals AILURE T SER E T IS AR I G C UL RESULT I AMAGE T T E E UI ME T R AT RST SSI LE I UR T ERS EL RESULTI G R M ELECTRIC S CK R T E A ECTE CA ACIT R E L I G E TREME CARE MUST E E ERCISE AT ALL TIMES E A LI G T ESE E ICES

Caution

The e uip ent escribe in this anual contains electrostatic sensitive evices ES s a age can occur to these evices i the appropriate han ling proce ure is not a here to

ESD Handling precautions:

A orking area here ES s ay be sa ely han le ithout un ue risk o a age ro electrostatic ischarge ust be available The area ust be e uippe as ollo s

Working Surfaces - All orking sur aces ust have a issipative bench at SA E or use ith live e uip ent connecte via a 1M2 resistor usually built into the lea to a co on groun point

Wrist Strap - A uick release skin contact evice ith a le ible cor hich has a built in sa ety resistor o bet een 5k2 an 1M2 shall be use The le ible cor ust be attache to a issipative earth point

Containers - All containers an storage ust be o the con uctive type

Batteries

This e uip ent contains an internal battery in a ition to the e ternal battery packs These batteries are re-cyclable an shoul be ispose o in accor ance ith local legislation They ust not be incinerate or ispose o as or inary rubbish

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1 INTRODUCTION

1.1 Purpose of this Manual

This Service Manual contains the in or ation an proce ures re uire or installing operating an servicing the anasonic GSM ersonal Cellular Mobile Telephone syste operating on the GSM igital Cellular et ork

1.2 Structure of the Manual

The anual is structure to provi e service engineering personnel ith the ollo ing in or ation an proce ures

1 General an technical in or ation - provi es a basic un erstan ing o the e uip ent kits an options together ith etaile in or ation or each o the a or co ponent parts

2 Installation an operating in or ation - provi es instructions or unpacking installing an operating the e uip ent

3 Servicing in or ation - provi es co plete instructions or the testing isasse bly repair an reasse bly o each a or co ponent part Step-by-step troubleshooting in or ation is given to enable the isolation an i enti ication o a al unction an thus eter ine hat corrective action shoul be taken The test in or ation enables veri ication o the integrity o the e uip ent a ter any re e ial action has been carrie out

4 Illustrate parts list - provi e to enable the i enti ication o all e uip ent co ponents or the or ering o spare replace ent parts

1.3 Servicing Responsibilities

The proce ures escribe in this anual ust be per or e by uali ie service engineering personnel at an authorise service centre

The service engineering personnel are responsible or ault iagnosis an repair o all e uip ent escribe in this anual

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2 GENERAL DESCRIPTION

2.1 General

This section provi es a general escription an kit co position etails or the GSM an portable Telephone syste an optional kits

The GSM han portable ay be con igure as

1 an portable unit

2 ehicle-po ere C a aptor han portable unit

3 an s ree vehicle- ounte unit

4 C a sen an receive via CMCIA Inter ace car

2.2 Handportable Main Kit

The han portable ain kit provi es a stan alone class 4 GSM telephone The plug-in SIM contains the subscriber an net ork in or ation necessary to operate the phone on a GSM net ork

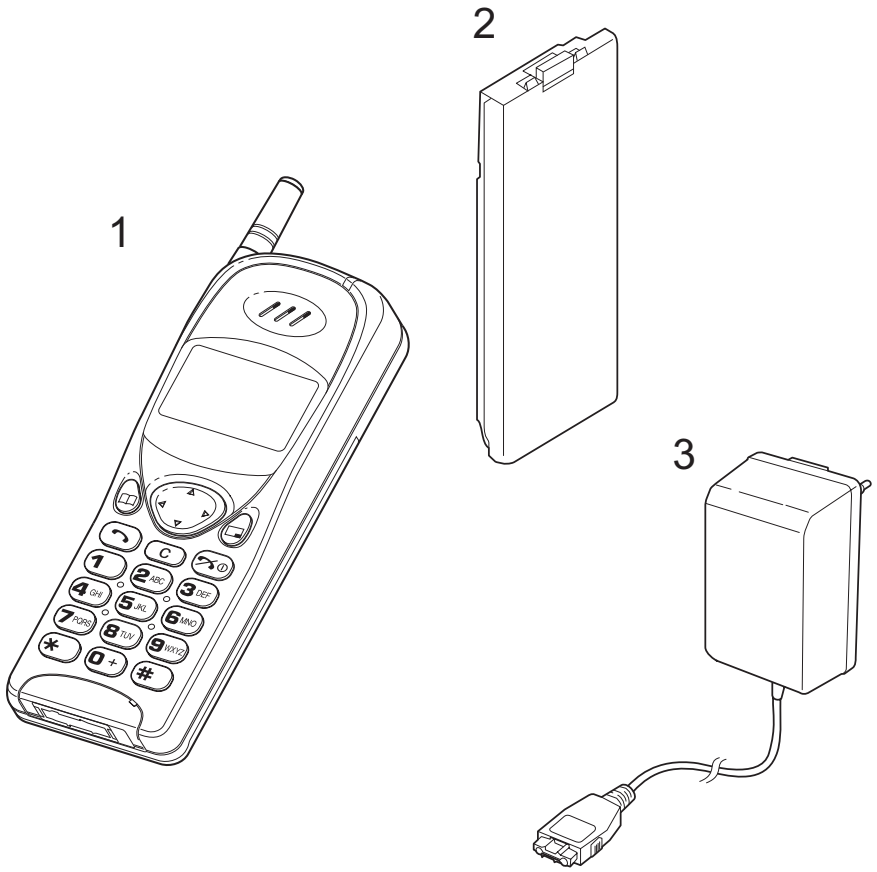

Figure 1: an portable Main Unit Kit 450-0201

IDENTIFICATION NUMBER	DESCRIPTION	PART NUMBER
1	Main unit	E -G450
2	attery	E - S450
3	A aptor	E -CA400 UK EU SA T
	perating instructions	See Section 2 11

2.3 Handsfree Car Mount Kit

The an s ree Car Mount Kit enables the han portable to be ounte in a vehicle an to operate in han s ree o e

The an s ree Unit contains a speaker ith separate volu e control Speech is via a icrophone ounte on the ashboar or the sun visor

The telephone can be operate in han hel o e by re oving it ro the ol er This ill use the e ternal antenna an po er ro the an s ree Unit

The han s ree unit also provi es e ternal po er or the han hel internal charger

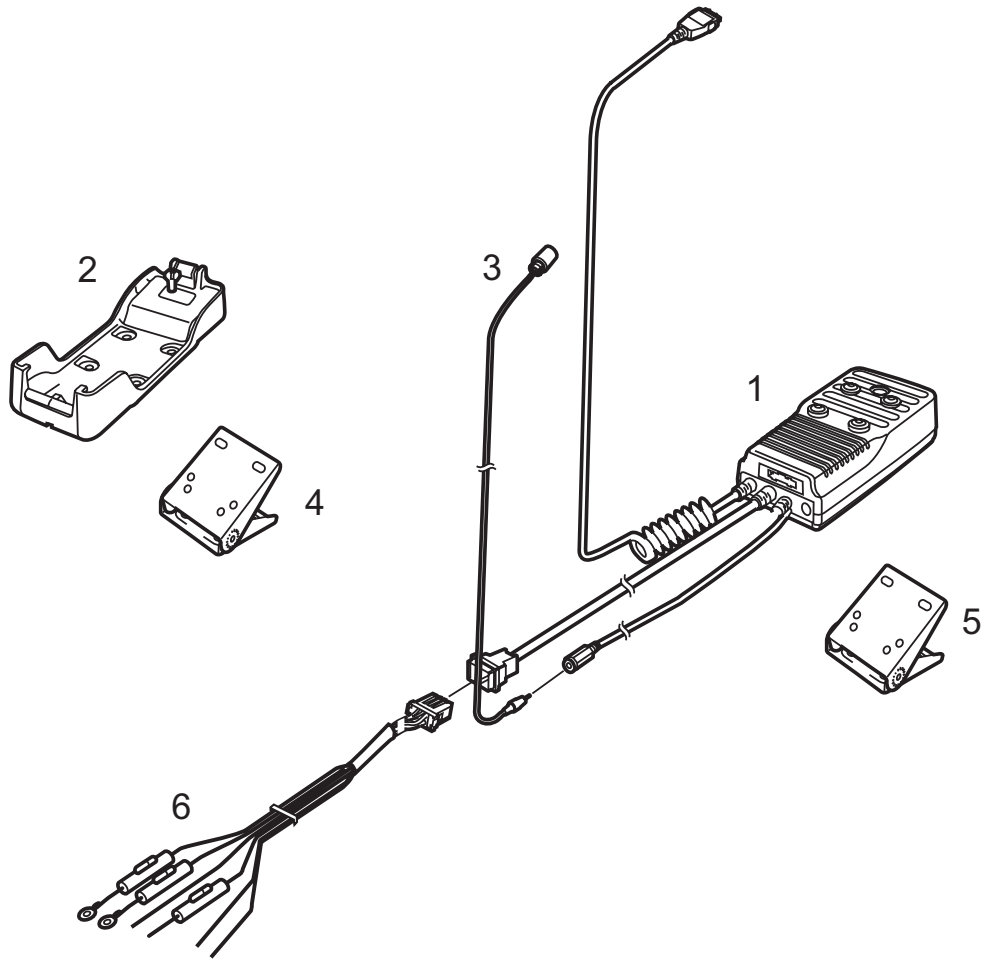

Figure 2: an s ree Car Mount Kit 450-0202

IDENTIFICATION NUMBER	DESCRIPTION	PART NUMBER
1	an s ree unit	E - 400
2	ol er G500	E -KA500
3	an s ree icrophone	E M1177
4	A ustable angle bracket	E 0001
5	A ustable angle bracket	E 0002
6	o er supply cable	E 70090

2.4 Easy Fit Car Kit

The Easy it Car Mount Kit is very si ilar to the an s ree Car Mount Kit The ain i erence ith the Easy it Car Mount kit is the a ition o a cigar lighter a aptor or the supply o po er The cigar lighter a aptor akes installation o the kit very si ple

The an s ree Unit contains a speaker ith separate volu e control Speech is via a icrophone ounte on the ashboar or the sun visor

ue to the length o cable ro the an s ree Unit to the telephone the telephone can only be use in han s ree o e

The an s ree Unit also provi es e ternal po er or the han hel internal charger

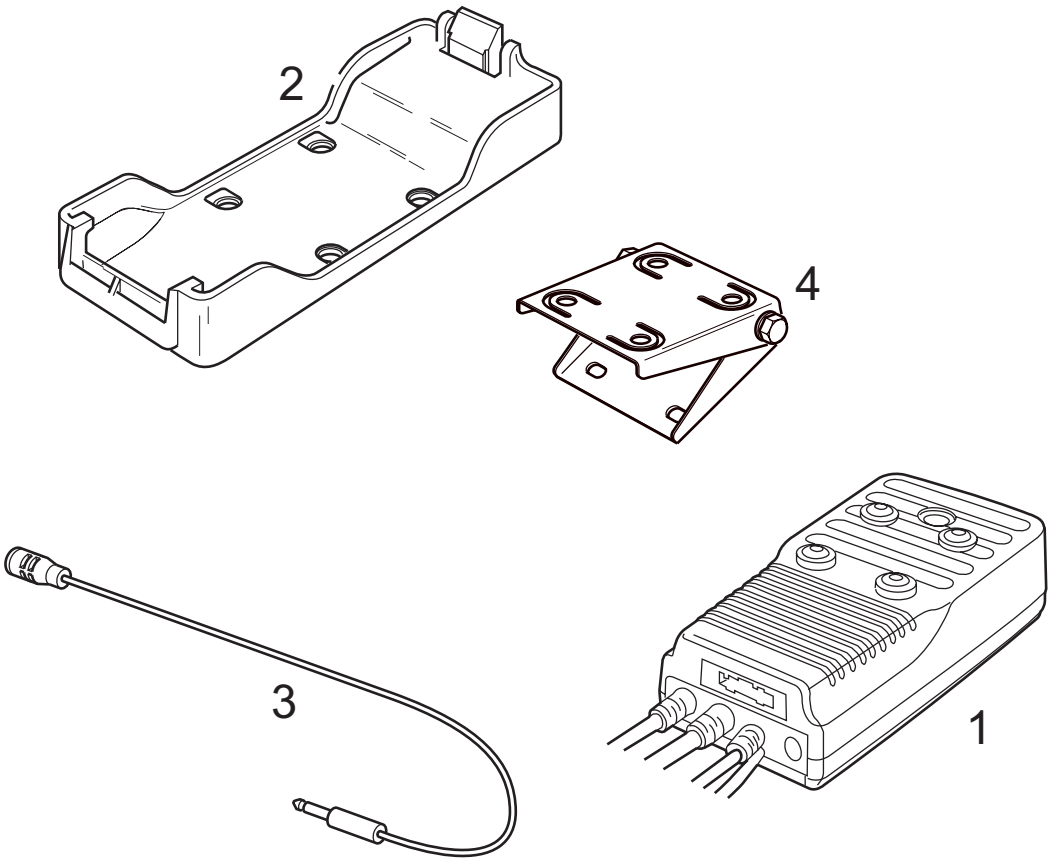

Figure 3: Easy it Car Mount Kit 450-0203

IDENTIFICATION NUMBER	DESCRIPTION	PART NUMBER
1	an s ree unit	E - 501
2	ol er G500	E -KA500
3	an s ree icrophone	E M1177
4	A ustable Angle racket	E 0001

2.5 Simple Car Kit

The Si ple Car Kit enables the han portable unit to be po ere ro a vehicle battery provi e that the vehicle has a cigar lighter socket an also has an e terna antenna connector or better signal uality hen in a vehicle

ne en o the C a aptor plugs into the han portable ith the telephone battery connecte The other en o the a aptor is pushe into the cigar lighter socket The e ternal antenna connector is an ME type

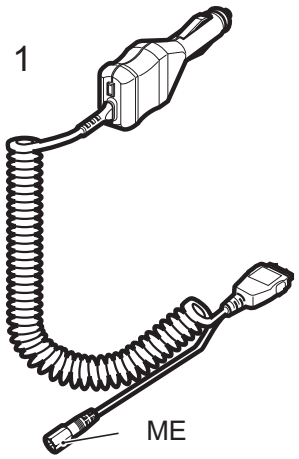

Figure 4: Si ple Car Kit 450-0204

IDENTIFICATION NUMBER	DESCRIPTION	PART NUMBER
1	Si ple Car Kit	E -K 500

2.6 DC Adaptor

The C A aptor kit enables the han portable unit to be po ere ro a vehicle battery provi e that the vehicle has a cigar lighter socket

ne en o the C a aptor plugs into the han portable ith the telephone battery connecte The other en o the a aptor is pushe into the cigar lighter socket

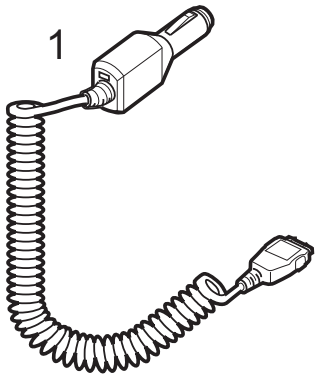

Figure 5: C A aptor 500-0203

IDENTIFICATION NUMBER	DESCRIPTION	PART NUMBER
1	C A aptor unit	E -C 400A

2.7 Holder Kit

The hol er kit allo s convenient ounting o the telephone in a vehicle In con unction ith the C a aptor this can ake a si ple car ount kit The a ustable angle bracket an telephone hol er are attache to a convenient i ing point in the vehicle

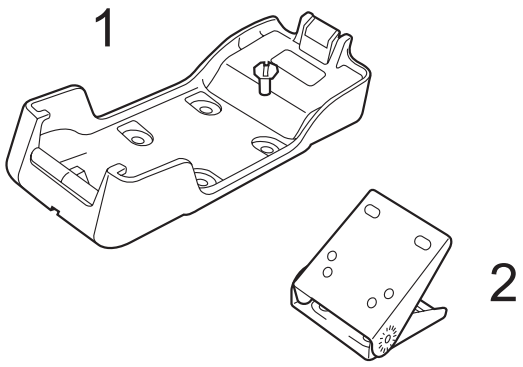

Figure 6: ol er Kit 500-0204

IDENTIFICATION NUMBER	DESCRIPTION	PART NUMBER
1	ol er	E -KA500
2	A ustable Angle racket	E 0002

2.8 Dual Charger and Carry Case

The ual charger has t o charging slots enabling the telephone battery to be charge in ivi ually or as a part o the hole telephone asse bly

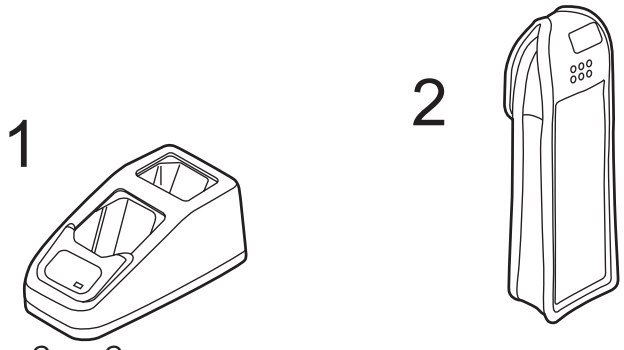

Figure 7: ual Charger an Carry Case 500-0205

IDENTIFICATION NUMBER	DESCRIPTION	PART NUMBER
1	ual charger	E -CR500
2	Carry case	E - K400

2.9 Battery Packs

There are our battery packs all o hich use i-M The attery ack S2 is 650 Ah the attery ack S is 600 Ah the attery ack M is 850 Ah an the attery ack L is 1600 Ah

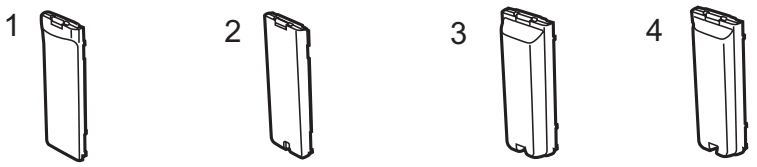

Figure 8: attery acks 450-0206

IDENTIFICATION NUMBER	DESCRIPTION	PART NUMBER
1	attery ack S	E - S500
2	attery ack M	E - M500
3	attery ack L	E - 500
4	attery ack S2	E - S450

2.10 PC Card

The C Car inter ace is use ith the han portable an a laptop personal co puter to provi e a C a an o e acility

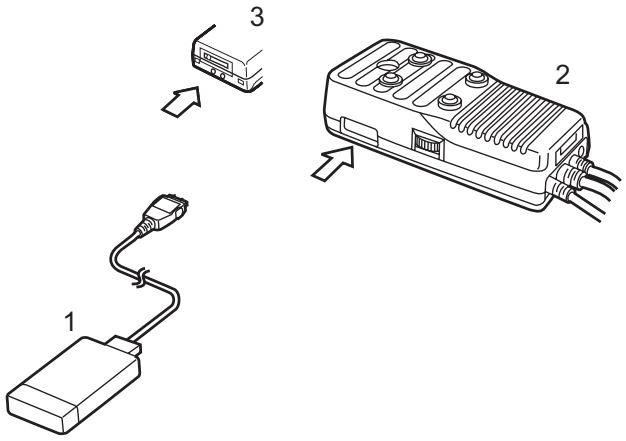

Figure 9: C Car 500-0207

IDENTIFICATION NUMBER	DESCRIPTION	PART NUMBER
1	C Car	E - A500
2	an s ree unit connection	
3	Telephone connection	

2.11 Documentation

In a ition to the kit contents liste in this section all kits also contain user ocu entation So e arkets ay re uire a itional ocu entation e g a speci ic arranty that is not liste

KIT TYPE	DOCUMENTATION
Main Unit Kit	**Operating Instructions** Arabic 71780A ulgarian 71802A C ech 71782A anish 71783A utch 71784A English 71785A innish 71786A rench 71787A Ger an 71788A Greek 71789A ungarian 71790A Italian 71791A or egian 71792A olish 71793A ortuguese 71794A Ro anian 71801A Russian 71795A Slovak 71800A Spanish 71796A S e ish 71797A Turkish 71798A **Quick Start** Arabic 71803A ulgarian 71804A C ech 71806A anish 71807A utch 71808A English 71809A innish 71810A rench 71811A Ger an 71812A Greek 71813A ungarian 71814A Italian 71815A or egian 71816A olish 71817A ortuguese 71818A Ro ananian 71819A Russian 71820A Slovak 71821A Spanish 71822A S e ish 71823A Turkish 71824A **European Warranty** ooklet 71556C Car 71557C
Optional Accessories	an s ree Car Mount Kit 71849A Easy it Car Mount Kit 71828A Si ple Car Kit 71857A C A aptor 70744C ol er Kit 71430A ual Charger 71431A Carry Case 70748A attery ack S 71539 attery ack M 71540 attery ack L 71541 AC A aptor 70745A SMS Cable 71432A

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3 OPERATING INSTRUCTIONS

3.1 General

This section provi es a brie gui e to the operation an acilities available on the G450 han portable unit Re er to the perating Instructions or ull operational in or ation

3.2 LCD Display

The G450 han portable unit has a 3 line by 12 character chip on glass li ui crystal isplay in con unction ith the ollo ing icons

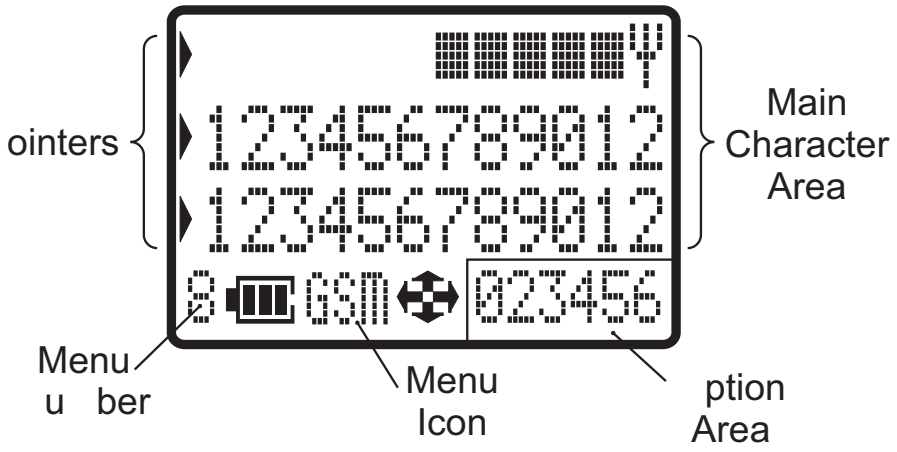

Figure 1: LC isplay 450-0301

▪▪▪▪▪▪	In icates receive signal strength ▪▪▪▪▪▪ strong signal area ▪ eak signal area
Ψ	In icates that it is possible to ake an e ergency call
Menu u ber	The nu ber o the eature pointe to by the pointer To access the a eature uickly enter the enu nu ber on the keypa
	isplays the battery charge level attery is at ull charge attery re uires recharging The battery icon lashes uring charging uring car ount use hen the battery is ully charge the battery icon ill not light
Menu Icon	isplays a s all icon relate to the current status o the telephone Key-guar is active an using the Key-guar eature honebook is in use using the Messages eature or you have unrea Short Te t Messages SMS using the Calls Service eature using the Call ivert eature or the telephone has Call ivert set Call ivert pro ile 1 is set Call ivert pro ile 2 is set using the Security eature or the telphone is locke GSM using the et orks eature using the ersonalise eature ABC sho s that nor al character are been entere in Alpha Entry ABΓ sho s that Greek character are been entere in Alpha Entry äää sho s that e ten e character are been entere in Alpha Entry 1-9 sho s that nu bers are been entere in Alpha Entry
	In icates that the navigation key can be presse Each arro ill light in ivi ually to in icate hich irection is vali
ption Area	ressing the select key ill select the option isplaye in the option area o the isplay

ollo ing so e operations the isplay ill auto atically clear a ter three secon s or a ter pressing any key e cept

3.3 Location of Controls

Incoming/Charge indicator:
Green inco ing call
Re charging battery pack

External connector:
Use to connect to e ternal accessories or charging e uip ent

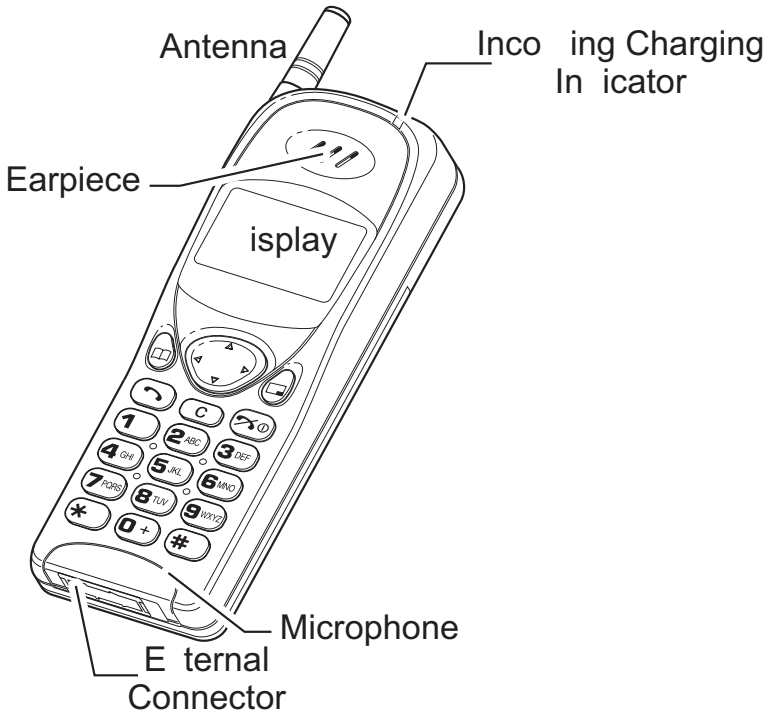

Figure 2: Location o controls or G450 450-0302

	avigation Key Scrolls through options or eatures enu an increases or ecreases volu e
	Select Key Selects option sho n in the ption Area o the isplay
	honebook Key ro ses through the honebook or stores a nu ber in the honebook Changes the type o characters entere uring Alpha Entry
	Sen Key Makes a call
C	Clear Key Clears the last igit entere clears all igits hen presse an hel or returns to the previous isplay
	En Key En s a call or s itches the telephone on o hen presse an hel
igit keys 0+ to 9WXYZ * an # here appropriate the 0+ key ill enter the international access co e il nu bers or pauses hen presse an hel	

3.4 Concept of Operation

There is a close relationship bet een the Secect Key avigation Key an isplay

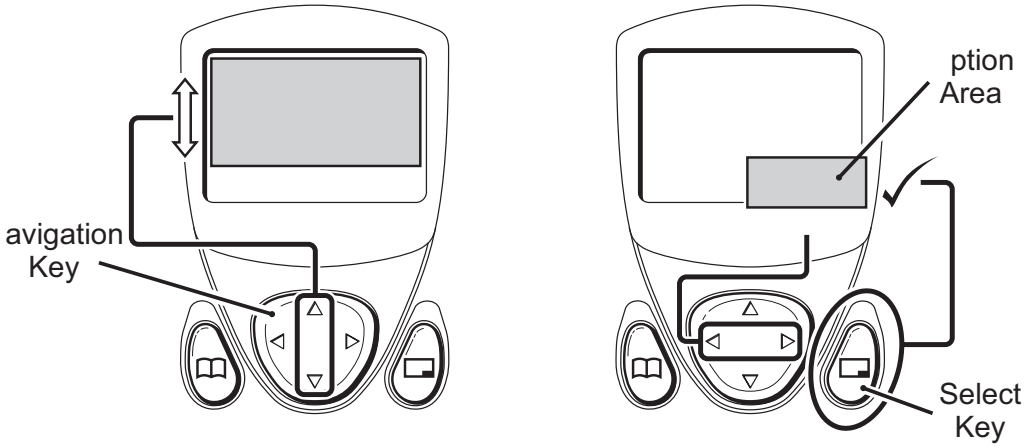

Figure 3: Concept o peration 450-0303

ressing up or o n ill ove the pointer up an o n an scroll through ore in or ation in the ain area o the isplay

ressing le t an right ill scroll through options in the option area o the isplay To choose the option press the Select Key

3.5 Alpha Entry

Alpha Entry is use to enter alphanu eric characters into honebook Short Messages an the Greeting Message

Key	Character peration			
	ABC	ABΓ	AÄÅ	1–9
1				1
2 ABC	A C a b c	A B Γ	A C a b c	2
3 DEF	E e	Δ E Z	E e	3
4 GHI	G I g h i	H Θ I	G I g h i	4
5 JKL	K L k l	K Λ M	K L k l	5
6 MNO	M n o	N Ξ O	M n o	6
7 PQRS	R S p r s	Π P Σ	R S p r s	7
8 TUV	T U t u v	T Y Φ	T U t u v	8
9 WXYZ	y	Ξ Ψ Ω	y	9
C	eletes the character above the cursor eletes the character to the le t hen at the en o the line or clears the entire entry hen presse an hel			

Each ti e a key is presse it ill isplay the ne t character hen another key is presse or no key is presse or a short ti e the cursor ill ove to the ne t position

To cycle bet een Greek characters ABΓ e ten e characters AÄÅ nu erals 1–9 an stan ar characters ABC press

3.5.1 Editing Alpha Entry

ressing ill ove you up or o n one line ressing ill ove you le t or right one character

hen the cursor is ove over a character an another key presse this ill insert the ne character

ressing C ill elete the character to the le t o the cursor

3.6 Features Menu Structure

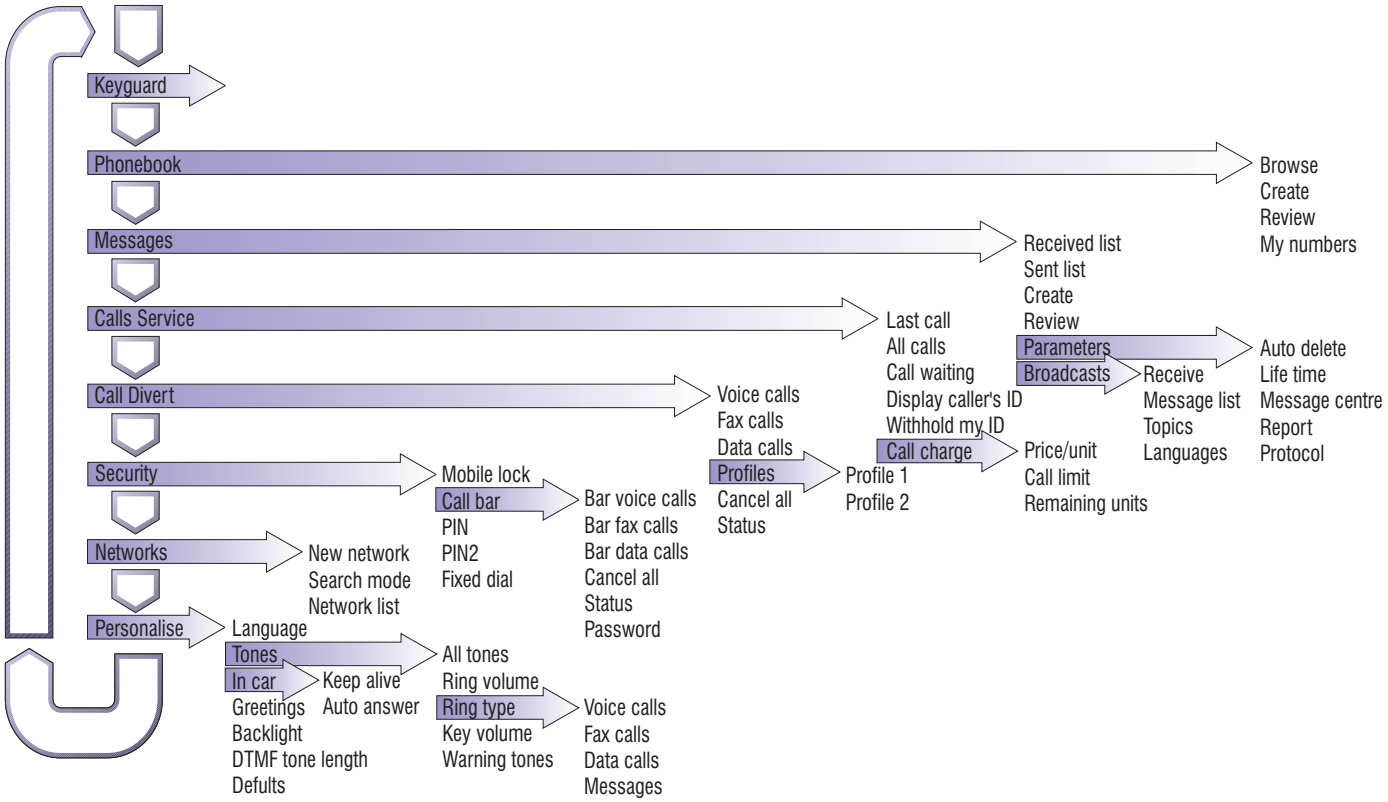

Figure 4: eature Menu 450-0304

3.7 Public Man Machine Interface (MMI)

It is possible to operate all GSM telephone in the sa e ay using the ublic MMI The ollo ing operations ill ork ith all GSM telephones o ever this in or ation is restricte to those operations that are supporte by G450

The an in the ollo ing proce ures shoul be replace by * an # receptivity Also S an E shoul be replace ith ↶ an 0 keys

3.7.1 Reading Phonebook Memory Location

MEM R L CATI
Lea ing eros can be le t out o the location nu ber e g 007 can be 7

3.7.2 Presentation of IMEI

0 6

3.7.3 Security

Change PIN

0 4 L I E I E I

Change PIN2

0 4 2 L I 2 E I 2 E I 2

Unblock PIN

0 5 I U L CKI G KE E I E I

Unblock PIN2

0 5 2 I 2 U L CKI G KE E I 2 E I 2

3.7.4 Call Hold

Place a call on hold

2 S

Recall a held call

2 S

Make a second call

TELE E UM ER S

Swap between two held calls

2 S

End held call

S

End active call

1 S

Reject incoming call

0 S

3.7.5 Call Waiting

Enable Call Waiting

4 3 S

Disable Call Waiting

4 3 S

Call Waiting Status

4 3 S

3.7.6 Calling Line Identification

Calling Line Identification Feature	Service Code
Calling Line I enti ication resentation CLI	30
Calling Line I enti ication Restriction CLIR	31
Connecte Line resentation CL	76
Connecte Line Restriction CL R	77

Enable
SER ICE C E S

isable
SER ICE C E S

Te porary suppress i enti ication
3 1 TELE E UM ER S

Te porary isplay i enti ication 3 1 TELE E UM ER S

3.7.7 Call Divert

Call Divert Type	Service Code
ivert all calls	21
ivert calls i busy	67
ivert calls i no reply	61
ivert i not reachable	62

Set e cept o Reply Call ar
SER ICE C E R AR TELE E UM ER TELEC MMU ICATI SER ICE S
Set o Reply Call ar
SER ICE C E R AR TELE E UM ER TELEC MMU ICATI SER ICE
TIME T RI G secon s S

Clear
SER ICE C E TELEC MMU ICATI SER ICE S

Status
SER ICE C E TELEC MMU ICATI SER ICE S

Clear all Call iverts
0 0 2

3.7.8 Call Bar

Call Bar Type	Service Code
All outgoing calls	33
utgoing international calls	331
utgoing international call e cept those to your LM country	332
All inco ing calls	35
Inco ing international calls hen roa ing	351

Set
ASS R TELEC MMU ICATI SER ICE S

Clear
ASS R TELEC MMU ICATI SER ICE S

Status
TELEC MMU ICATI SER ICE S

Clear all Call ar Types
3 3 0 ASS R S

Change Call ar ass or
0 3 L ASS R E ASS R E ASS R S

3.7.9 Telecommunication Services Used for Public MMI

Teleservice

Service	MMI Service Code
All teleservices	10
Telophony	11
All ata telesevices	12
acsi ile services	13
Short Message Services SMS	16
All teleservices e cept SMS	19
oice group services	17

Bearer Service

Service	MMI Service Code
All bearer services	20
All async services	21
All synchronous services	22
All ata synchronous services	24
All ata asynchronous services	25
All e icate packet access	26
All e icate A access	27

3.8 Troubleshooting

The user is given the ollo ing in or ation an a vise to contact the ealer i the proble s persist

Problem	Causes and Solutions
Telephone ill not s itch on	Check that the battery pack is ully charge an correctly connecte to the telephone
Short battery li e	attery li e is a ecte by the net ork you are using an the con ition o the battery pack The li e o the battery pack is a ecte by i proper charging this is inherent in all i-M an i-C batteries To aintain a i u per or ance al ays use until the lo battery arning an then ully recharge the battery pack To revive the battery pack use the telephone until it s itches o an then ully recharge three ti es o ever the battery pack ill eventually ear out an ust be replace ith a ne one
attery level in icator oes not light hen charging	I a battery is eeply ischarge it ill take a short ti e be ore there is su icient po er in the telephone to isplay the battery level in icator The battery pack ust be charge in a te perature no lo er than 5 C an no higher than 35 C
Calls cannot be a e	Calls cannot be a e hen the telephone is locke or outgoing calls are barre Check that the telephone is registere to a net ork Move to a coverage area an operate your telephone a ter it has registere ith a net ork
Calls cannot be a e ro i e ial Me ory	Check the telephone nu ber is store in i e ial Me ory or your SIM supports i e ial Me ory
Calls cannot be receive	To receive a call the telephone ust be s itche on Calls cannot be receive hen inco ing calls are barre
E ergency calls cannot be a e	Check that the antenna sy bol is isplaye Move to a coverage area an operate your telephone hen the antenna sy bol is isplaye
Telephone nu bers cannot be recalle	Me ory cannot be recalle hen the telephone is ully locke or i e ial is s itche on

3.9 Error Messages

The ollo ing table is a list o error essages that ay occur uring use o the telephone ith a escription an suggeste course o action

Area not allo e	Roa ing in the selecte area is not allo e
Enter UK	The I has been entere incorrectly 10 ti es To enter a ne I you ust irst enter a UK
et ork not allo e	Roa ing ith the selecte net ork is not allo e
UK blocke	The UK has been entere incorrectly 10 ti es Contact your Service rovi er
Security ailure	The net ork has etecte authentication ailure because your SIM is not registere ith that net ork Contact your Service rovi er
SIM blocke	The SIM is blocke because the rong UK has been entere ten ti es Contact your Service rovi er
SIM error	The telephone has etecte a proble ith the SIM S itch the telephone o an then back on I the essage oes not isappear contact your Service rovi er

3.10 Security Codes

CODE TYPE	NUMBER OF DIGITS	DESCRIPTION
ersonal I enti ication u ber I	4 to 8	Controls SIM security Supplie by the service provi er
I 2	4 to 8	Controls e ory security Supplie by the service provi er
I I 2 Unblocking Key UK UK 2	8	Use to unblock I an I 2 A I or I 2 ill beco e blocke i the rong I or I 2 is entere three ti es hen the blocke I or I 2 is unblocke a ne I or I 2 ust be entere I the rong UK or UK 2 is entere 10 ti es your SIM ill be unusable Supplie by the service provi er
ass or	4	Controls the call bar unction I the rong pass or is entere three ti es this service ill be revoke Supplie by the service provi er
Lock Co e	4	Controls telephone security actory set to 0000

3.11 GSM Services Supported by PC Card

Bearer Service Number	Bearer Service Rate	Access Structure	Access Rate	Information Transfer	Error Correction Options
21	Asynchronous 300 bps	Asynch	300 bps	U I or o e	T or T
22	Asynchronous 1 2 kbps	Asynch	1 2 kbps	U I or o e	T or T
23	Asynchronous 1200 75 bps	Asynch	1200 75 bps	U I or o e	T or T
24	Asynchronous 2 4 kbps	Asynch	2 4 kbps	U I or o e	T or T
25	Asynchronous 4 8 kbps	Asynch	4 8 kbps	U I or o e	T or T
26	Asynchronous 9 6 kbps	Asynch	9 6 kbps	U I or o e	T or T
41	e icate A Access 300 bps	Asynch	300 bps	U I	T or T
42	e icate A Access 1 2 kbps	Asynch	1 2 kbps	U I	T or T
44	e icate A Access 2 4 kbps	Asynch	2 4 kbps	U I	T or T
45	e icate A Access 4 8 kbps	Asynch	4 8 kbps	U I	T or T
46	e icate A Access 9 6 kbps	Asynch	9 6 kbps	U I	T or T

U I Unrestricte igital In or ation
T Transparent non-error correcte
T on-Transparent error correcte

AT co an s to select these services are C ST an CI

3.12 GSM Network Codes and Names

Country	Access Code	Network			
		Operator	Name	Abbreviation	Code
A	37	STA A RRA	M ILA	M-A	213 03
AUS	61	TELEC M Australia	M ILE ET	M- ET	505 01
AUS	61	TUS Co unications ty Lt	TUS Mobile	TUS	505 02
AUS	61	o a one T	A E	E	505 03
A	43	T Austria	A1	A1	232 01
EL	32	elgaco Mobile	R IMUS	R I	206 01
G	359	M ILTEL A	CITR GSM	CITR	284 01
R	973	A REI Teleco unications Co	M ILE LUS	M LUS	426 01
C	41	S iss Teleco TT	ATEL GSM	AT	228 01
C	86	China Unite Teleco uni-cations Corporation	C I A U IC M	CU-GSM	460 01
C	357	Cyprus Teleco unication Authority	C TAGSM	C -GSM	280 01
	49	eTeMobil G b	Mobil unk 1	1	262 01
	49	Mannes ann Mobil unk	2 RI AT	2	262 02
E	34	TELE ICA M ILES	M ISTAR	MSTAR	214 07
E	34	AIRTEL S AI	AIRTEL	AIRTL	214 01
EE	372	Eesti Mobiiltele on	EMT GSM	EMT	248 01
EE	372	RA I LI A EESTI AS	EESTI	RLE	248 02
K	45	TELE an ark Mobile	T K-M IL	T M	238 01
K	45	ansk Mobil Tele on MT	S	S	238 02
	33	rance Teleco	Itineris	Itine	208 01
	33	S R	S R	S R	208 10
	33	SRR	S R REU I	S R RU	647 10
	33	TIKI E	I I	I I	547 20
I	358	Teleco inlan	TELEC M I	TELE	244 91
I	358	Ra iolin a A	RA I LI A	RL	244 05
GI	350	GI TEL	GI TEL	GI TEL	266 01
GR	30	ana on S A	A A	A	202 05
GR	30	STET ELLAS	TELESTET	TLSTET	202 10
	36	estel 900 GSM RT	ESTEL 900	-900	216 30

Country	Access Code	Network			
		Operator	Name	Abbreviation	Code
	36	annon GSM RT	A GSM	A	216 01
K	852	ong Kong Teleco CSL Lt	TCSL GSM	TCSL	454 00
K	852	utchison Telephone Co Lt	TCLGSM	TCL	454 04
K	852	S arTone Mobile Co unications Lt	SMART E	KSMC	454 06
R	95	T	CR ET	CR	219 01
I	39	M ITEL R T ITALIA	M ITEL	M I	222 10
I	39	TELEC M ITALIA M ILE	ITALIA M ILE	TIM	222 01
I A	91	harti Cellular Li ite	AirTel	AIRTL	404 10
I A	91	L S STEMS R ECTS LT I IA	L - M ILE	L	404 21
I	62	T Teleko unikasi In onesia	TELK MSEL	T-SEL	510 10
I	62	T SATELIT ALA A I ESIA	SATELI C EL	SAT-C	510 01
I	62	T E CELC MI RATAMA	E CELC M	E -CEL	510 11
IRL	353	Teleco Irelan	EIRCELL-GSM	E-GSM	272 01
KSA	966	ELECTR IC A LICATI S ESTA LIS ME T	EAE-AL A AL	EAE	420 07
KT	96	Mobile Teleco unications Co	MTC*N*et	MTC	419 02
L	352	T Lu e bourg	LU GSM	T L	270 01
L	371	Latvian Mobile Telephone Co Lt	LMT GSM	LMT	247 01
MAC	853	C T M	TELEM EL	CTMGSM	455 01
M R	212	T M R CC	T	T	604 01
MRU	60	MAURITIUS TELEC M LT	CELL LUS	CELL	617 01
M	60	I ARIA G C MMU ICATI S S	a is obile	a is	502 12
	47	Telenor Mobil AS	Telenor Mobil	Tele	242 01
	47	etCo GSM A S	etCo GSM	C M	242 02
L	31	LI ERTEL	LI ERTEL	LI TEL	204 04
L	31	TT Teleco	TT TELEC M	L TT	204 08
	64	ELLS UT	ELLS UT	S	530 01
	351	Teleco unica oes Moveis acionais TM	TM	TM	268 06
	351	TELECEL	TELECEL	TLCL	268 01

Country	Access Code	Network			
		Operator	Name	Abbreviation	Code
	63	Globe Teleco GMCR Inc	Globe Teleco	GL E	515 02
	63	Isla Co unications Co Inc	Islaco	ISLA	515 01
AT	974	-TEL	ATAR ET	- ET	427 01
R C	886	L TA	L TA GSM	L GSM	466 92
RL	961	Teleco inlan International	LibanCell	LibCL	415 03
RUS	701	Mobile Telesyste s	MTS	MTS	250 01
RUS	701	orth- est GSM	orth- est GSM	GSM	250 02
S	46	Telia Mobitel	TELIA M ITEL	TELIA	240 01
S	46	C M I GSM A	C M I	I	240 07
S	46	EUR LITA A	EUR LITA	EUR	240 08
SA	27	AC M	o aCo	A	655 01
SA	27	Mobile Telephone et orks	MT	MT	655 10
SG	65	Singapore Teleco	ST-GSM	STGSM	525 01
SRI	94	MT ET RKS T SRI LA KA	IAL G	AL G	413 02
S R	963	Mobile Syria	M ILE S RIA	S R M	417 09
T	66	A vance In o Service ublic Co pany Li ite	AIS GSM	T AIS	520 01
TR	90	TT Turkey	TURKCELL GSM	TCELL	286 01
TR	90	TT Turkey	TT TELSIM GSM	TLSIM	286 02
UAE	971	ETISALAT	ETISALAT	ETSLT	424 02
UK	44	Cellnet	CELL ET	CL ET	234 10
UK	44	GUER SE TELEC MS	GUER SE TEL	GS -TEL	234 55
UK	44	ersey Teleco s	ersey Tele	ER1	234 50
UK	44	MA TELEC M	R T GSM	MA	234 58
UK	44	o a one	A E	A	234 15

3.13 Glossary of Terms

TM	ual Tone Multiple re uency tones The nu eric keys 0 to 9 an an ill generate i erent TM tones hen presse uring conversation These are use to access voice ail paging an co puterise ho e banking
GSM	Global Syste or Mobile co unications The na e given to the a vance igital technology that your telephone uses
o e country	The country here your ho e net ork operates
o e net ork	The GSM net ork on hich your subscription etails are hel
Lock co e	Use or security o your telephone actory set to 0000
Message Centre	here essages are sent be ore they are or ar e onto their estination The Message Centre telephone nu ber ay be progra e into your SIM or supplie by your service provi er
et ork operator	The organisation responsible or operating a GSM net ork Each country ill have at least one net ork operator
ass or	Use or the control o the call bar unction Supplie by your service provi er
I	ersonal I enti ication u ber use or SIM security Supplie by your service provi er
I 2	ersonal I enti ication u ber use or the control o i e ial Me ory an call charge etering Supplie by your service provi er
UK UK2	I I 2 Unblocking Key Use to unblock the I I 2 Supplie by your service provi er
Registration	The act o locking on to a GSM net ork This is usually per or e auto atically by your telephone
Roa ing	The ability to use your telephone on net orks other than your o e net ork
Service provi er	The organisation responsible or provi ing access to the GSM net ork
SIM	Subscriber I enti ication Mo ule A s all s art-car hich stores uni ue subscriber an user-entere in or ation such as hone ook i e ial Me ory an short essages Supplie by your service provi er
Supple entary service	et ork-controlle GSM unctions hich your telephone ill support Supple entary services ay only be available on a subscription bases
il nu bers	Spaces in a store telephone nu ber hen the telephone nu ber is recalle pressing a nu eric key ill ill in a space This can be use to restrict ialling to a speci ic area

4 INSTALLATION GUIDE

4.1 General

This section escribes the proce ure use to install the GSM han portable unit into a negative-groun e vehicle

Caution:

o not atte pt to install this e uip ent into a positive-groun e vehicle

o not atte pt to supply po er to the e uip ent ro a positive-groun e vehicle

Installation ill be per or e using either o the ollo ing kits

1 an s ree car ount kit

2 C a aptor

4.2 Handsfree Car Mount Kit

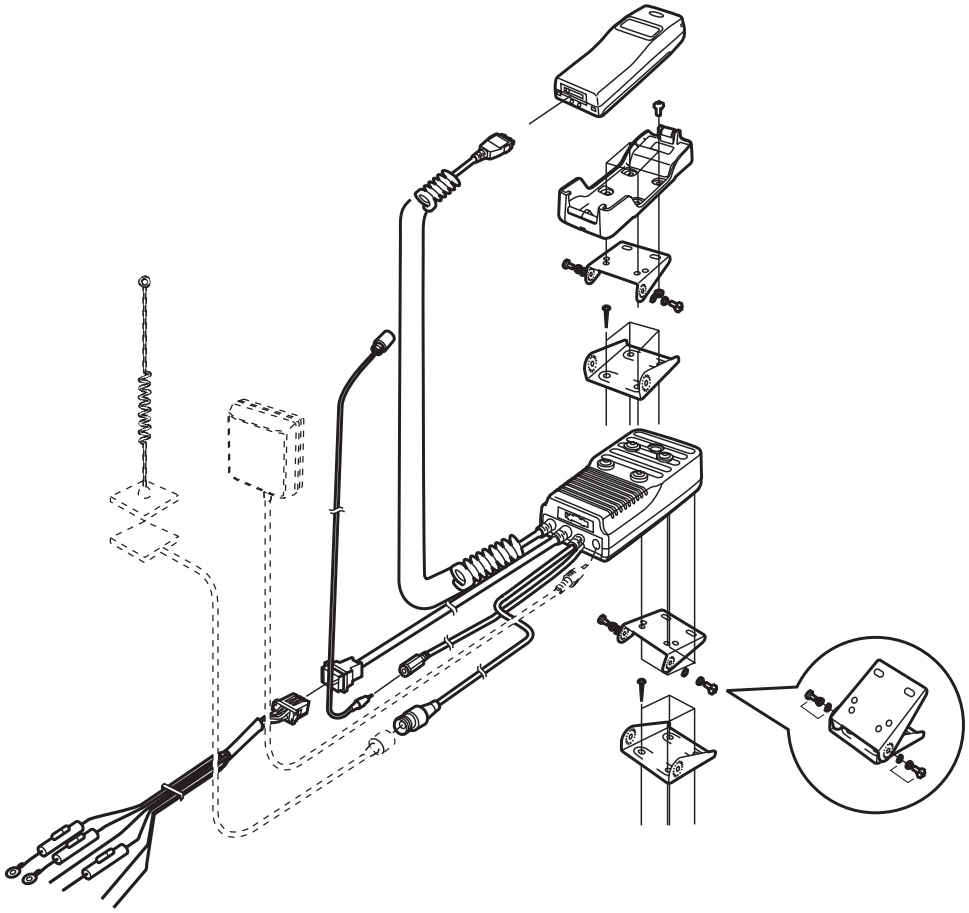

Figure 1: an s ree Car Mount Kit 500-0401

4.2.1 Selecting the Location for the Handsfree Unit

The ollo ing points shoul be consi ere hen choosing a location or the han s ree unit

Ensure that the location oes not obstruct nor al operation unctioning o the vehicle

Ensure that the location oes not a ect passenger acco o ation or is sub ect to e cessive shocks

Ensure that the location ill allo easy operation o the unit

Ensure that the location provi es a secure i ing or the unit

Avoi irect e posure to the sun s rays or to rain

Ensure that the location takes ue consi eration o cable routing re uire ents

Consi ering the points liste above the reco en e locations or ounting the han s ree unit are the ashboar Ar Rest Storage Co part ent or the Centre Console

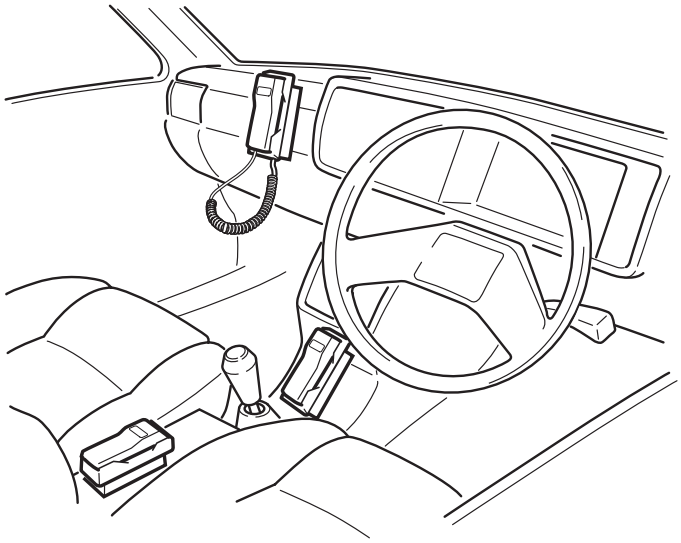

Figure 2: an s ree Cra le Unit Locations 500-0402

4.2.2 Wiring

Locations or the han s ree unit ill vary accor ing to the type o vehicle as ill the routing o po er an interconnecting cables The ollo ing precautions shoul be observe

T install or connect the unit into a positive groun e vehicle This e uip ent ust be installe into a 12 negative - groun vehicle

Mount cables to the vehicle so that they are not prone to isplace ent or isconnection through vibration

Route cables through e isting holes in the ashboar bulkhea s etc here possible

Site cables so that contact ith oving parts brake clutch pe als seat echanis s etc is avoi e

Site cables as ar a ay as possible ro e isting cabling to avoi electrical in uction

Shiel cables to protect inter erence ith the vehicle electronics

hen connecting cables to the vehicle circuitry ensure that the vehicle unctions are not a ecte

A typical car installation is illustrate belo the actual location o units ay vary accor ing to vehicle type

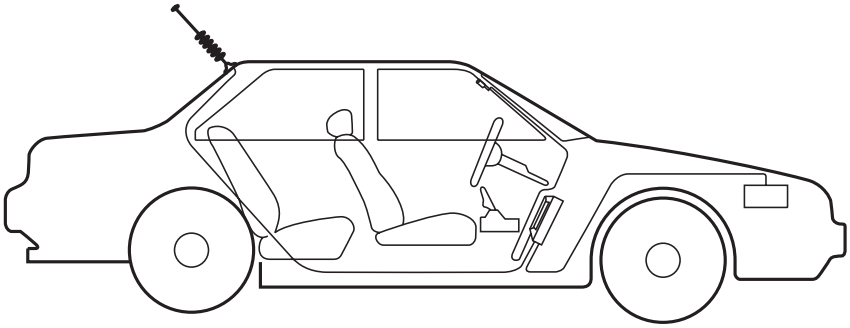

Figure 3: Car installation 500-0403

Wiring guide

Colour	**Connection**	**Fuse**
lack	Groun	4A
lue	Ignition	3A
Re	attery	3A
ello	Ra io Mute	

4.2.3 Installation with the Adjustable Angle Bracket

The A ustable Angle racket can be use to install the an s ree Unit in the ollo ing con igurations

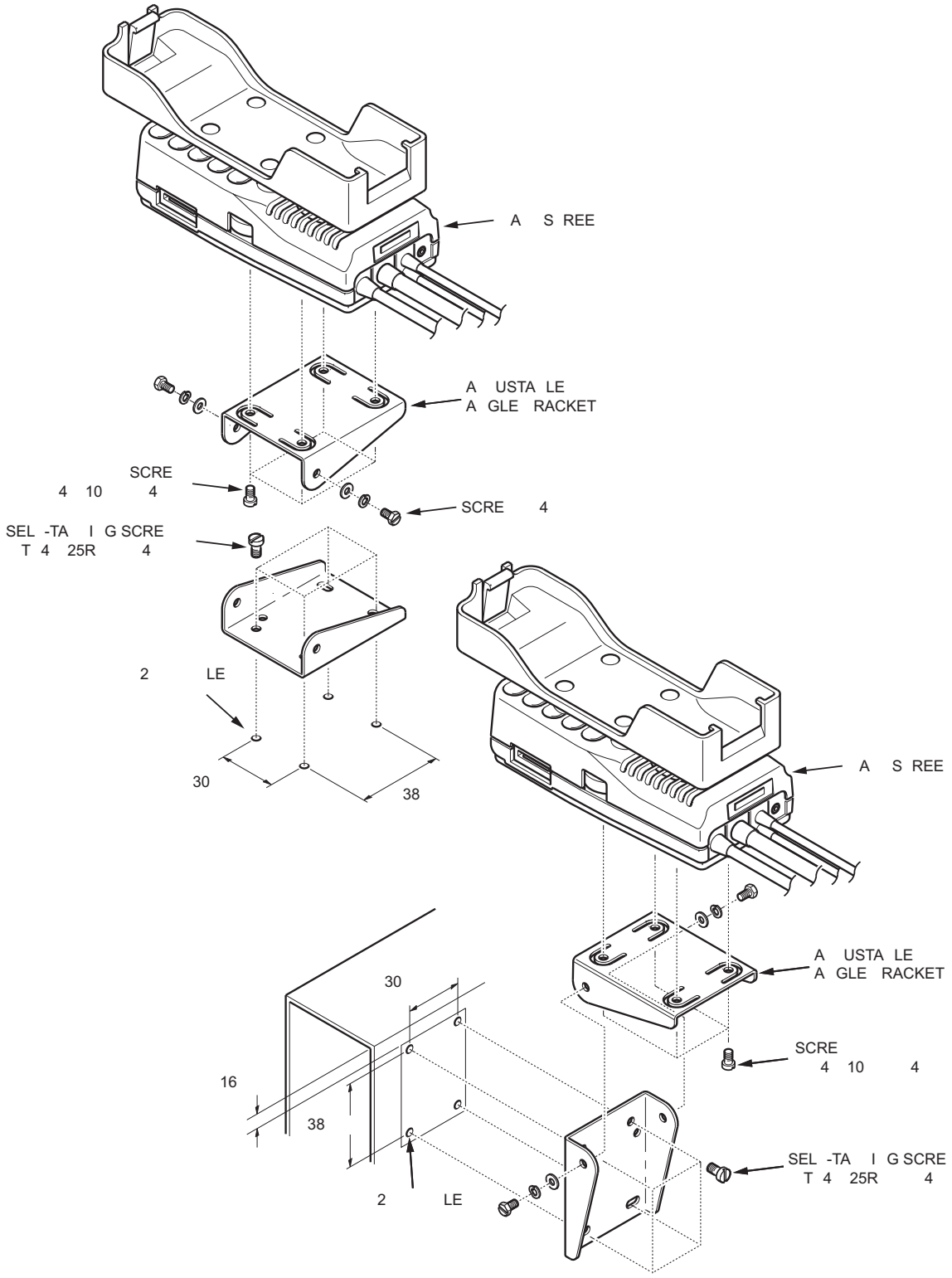

Figure 4: A ustable angle bracket con igurations 500-0404

4.2.4 Installing the Handsfree Microphone

The ollo ing points shoul be consi ere hen installing the han s ree icrophone

That it oes not obstruct the operation o the vehicle

That it oes not a ect the nor al passenger acco o ation

That the icrophone shoul ace the river s outh at a istance o appro i ately 30c

Mounting the Microphone to the Sun Visor

1 Mount the icrophone onto the sun visor clip by inserting the pro ection o the clip into the hole o the icrophone base

2 Mount the icrophone onto the sun visor as sho n in igure 5

3 Connect the icrophone to the lying lea ro the han s ree cra le

Mounting the Microphone to the Dashboard

1 Attach the a hesive pa to the ashboar clip

2 rill a 1 hole at the ounting location an ount the clip using a M2 5 sel -tapping scre

3 Insert the pro ection o the clip into the icrophone base ensuring that it points to ar s the river outh

4 Connect the han s ree icrophone to the han s ree cra le

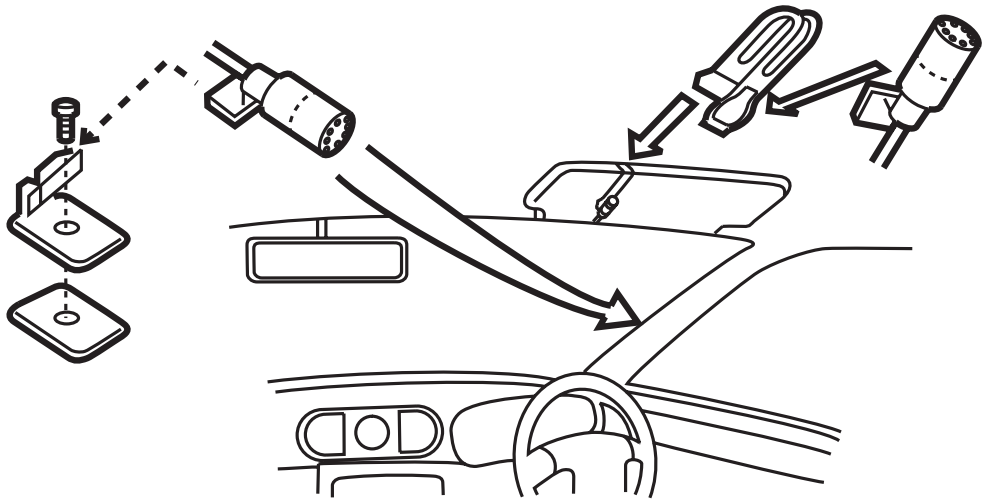

Figure 5: Microphone Installation 500-0405

4.3 DC Adaptor

The telephone is po ere irectly ro the 12 cigar lighter socket S itch the telephone po er o an it the C po er cable

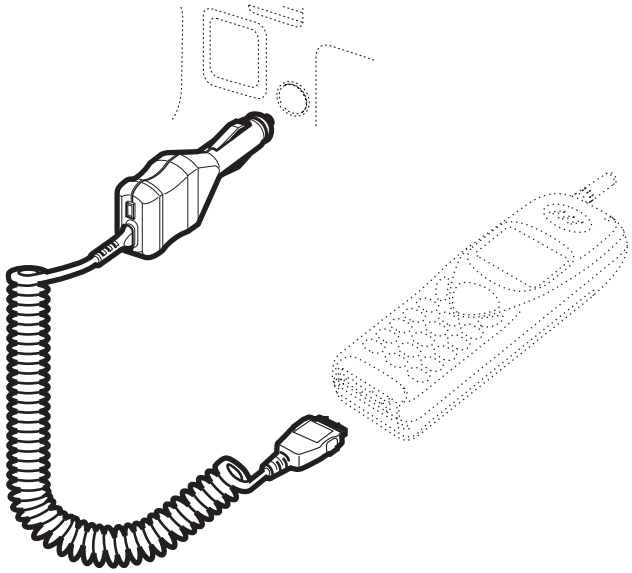

Figure 6: C A aptor Installation 450-0406

4.4 Simple Car Kit

The telephone is po ere irectly ro the 12 cigar lighter socket To i prove signal uality the e ternal antenna is connecte to the ME type connector

S itch the po er o an it the connector to the telephone

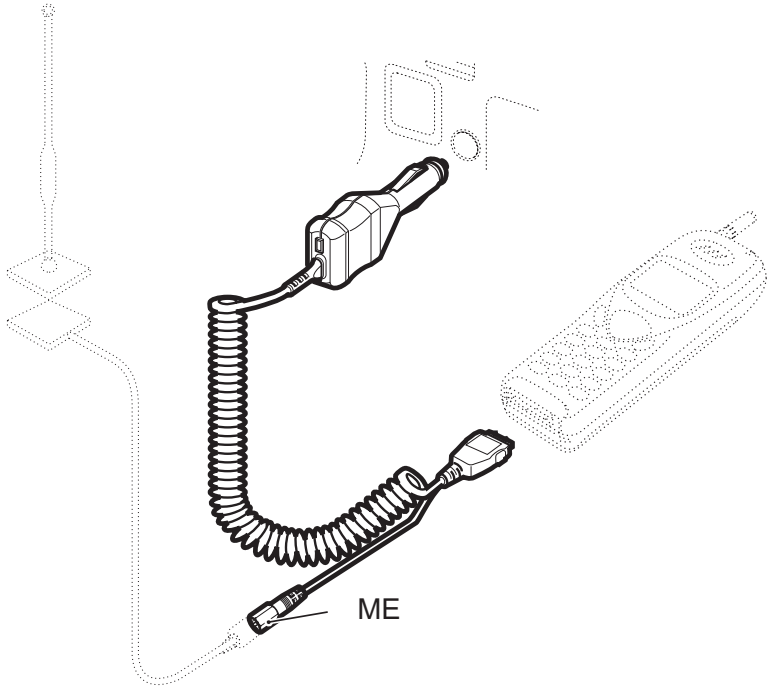

Figure 7: Si ple Car Kit Installation 450-0407

5 DISASSEMBLY/REASSEMBLY INSTRUCTIONS

5.1 General

This section provi es isasse bly an reasse bly proce ures or the ain co ponents o the G450 syste
These proce ures MUST be per or e by uali ie service personnel at an authori e service centre
The ollo ing arnings an precautions MUST be observe uring ALL isasse bly reasse bly operations

WARNING

The e uip ent escribe in this anual contains polarise capacitors utilising li ui electrolyte These evices are entirely sa e provi e that neither a short-circuit nor a reverse polarity connection is a e across the capacitor ter inals AILURE T SER E T IS AR I G C UL RESULT I AMAGE T T E E UI ME T R AT RST SSI LE I UR T ERS EL RESULTI G R M ELECTRIC S CK R T E A ECTE CA ACIT R E L I G E TREME CARE MUST E E ERCISE AT ALL TIMES E A LI G T ESE E ICES

Caution

The e uip ent escribe in this anual contains electrostatic sensitive evices ES s a age can occur to these evices i the appropriate han ling proce ure is not a here to

ESD Handling precautions:

A orking area here ES s ay be sa ely han le ithout un ue risk o a age ro electrostatic ischarge ust be available The area ust be e uippe as ollo s

Working Surfaces - All orking sur aces ust have a issipative bench at SA E or use ith live e uip ent connecte via a 1M2 resistor usually built into the lea to a co on groun point

Wrist Strap - A uick release skin contact evice ith a le ible cor hich has a built in sa ety resistor o bet een 5k2 an 1M2 shall be use The le ible cor ust be attache to a issipative earth point

Containers - All containers an storage ust be o the con uctive type

5.2 Handportable Unit

5.2.1 Disassembly

1. igure 1 ress the release clip then tilt up ar s to re ove the battery ro the telephone

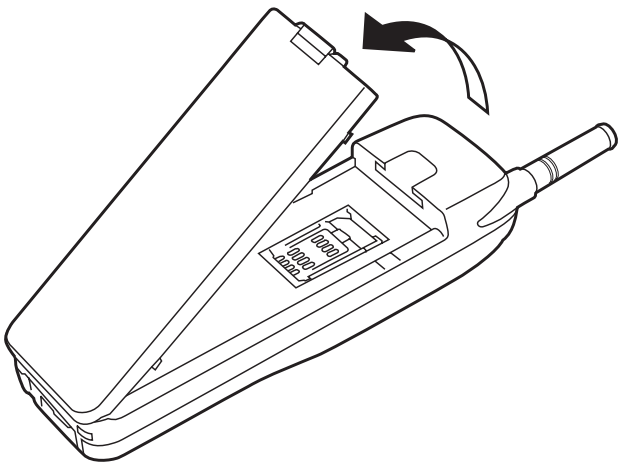

Figure 1: attery re oval 450-0501

2. igure 2 Re ove the back ro the telephone case 2 scre s

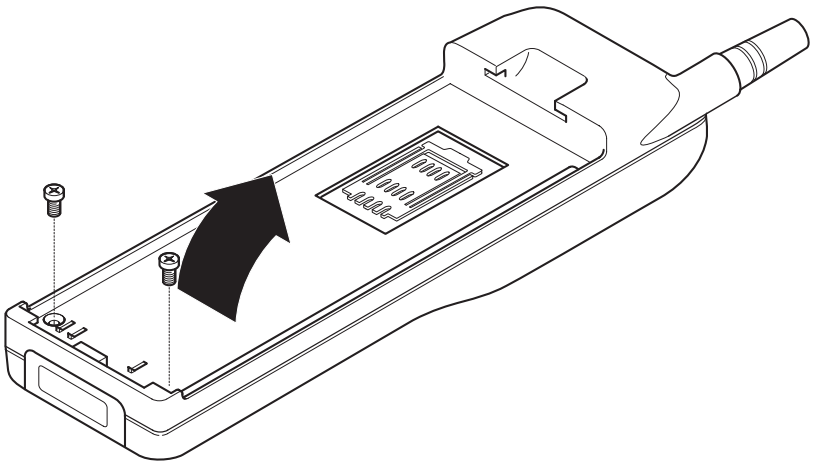

Figure 2: Case isasse bly 450-0502

3. **(** igure 3 Re ove the C asse bly 2 scre s

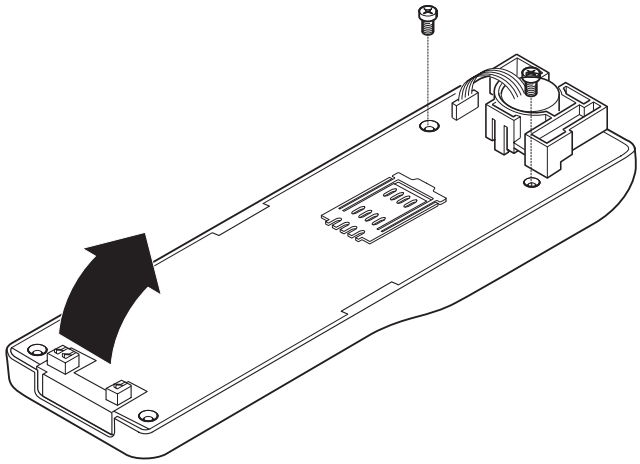

Figure 3: C asse bly re oval 450-0503

4. igure 4 Re ove the R boar ro the C chassis

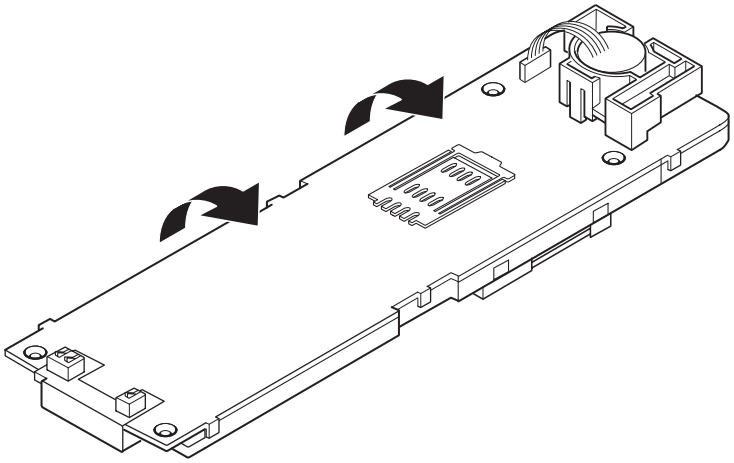

Figure 4: R C re oval 450-0504

5. igure 5 Re ove the icrophone ro the C asse bly

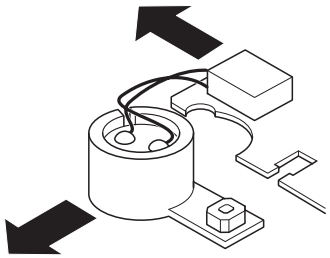

Figure 5: Microphone re oval 450-00505

6. igure 6 Re ove the bu er ree -s itch asse bly cable ro the cable cla p

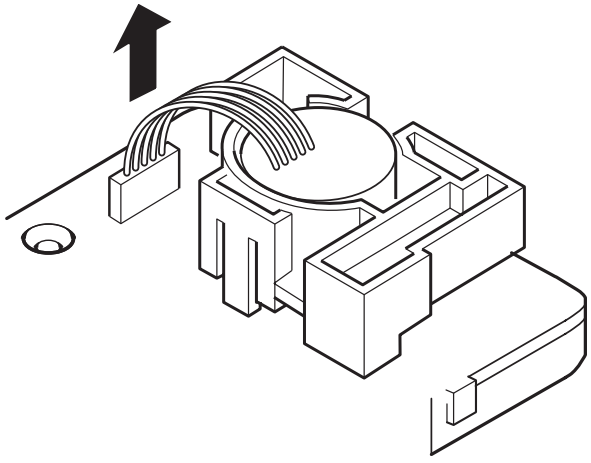

Figure 6: u er ree -s itch cable re oval 450-0506

7. igure 6 Unclip the bu er ree -s itch asse bly ro the R C

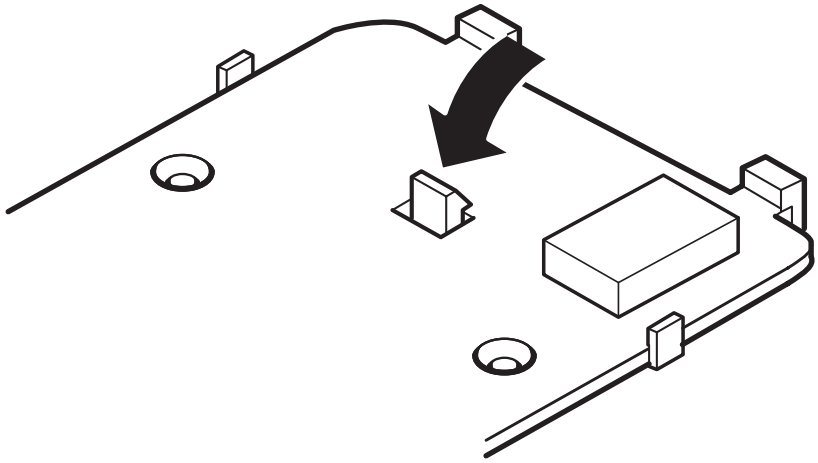

Figure 7: u er ree -s itch asse bly re oval 450-0507

8. igure 8 Tip LC isplay or ar to allo re oval o the LC earpiece hol er

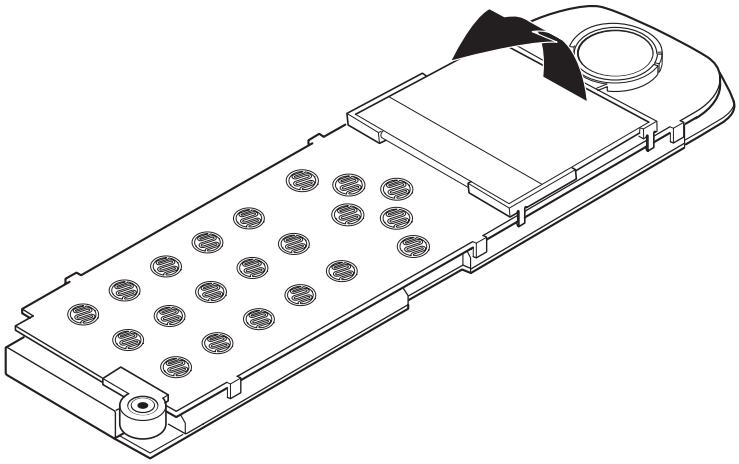

Figure 8: LC re oval 1 450-0508

9. igure 9 Unplug the speaker connector ro the logic C

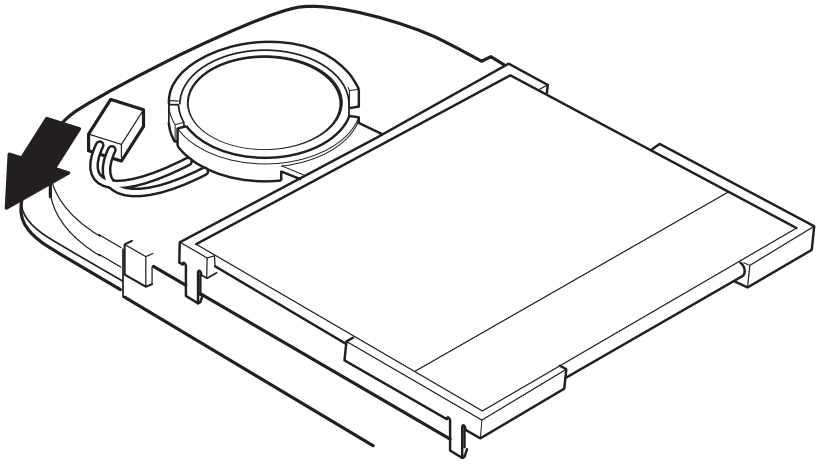

Figure 9: Speaker re oval 450-0509

10. igure 10 Gently ben the lugs on the LC earpiece hol er out ar s an li t ro the logic C

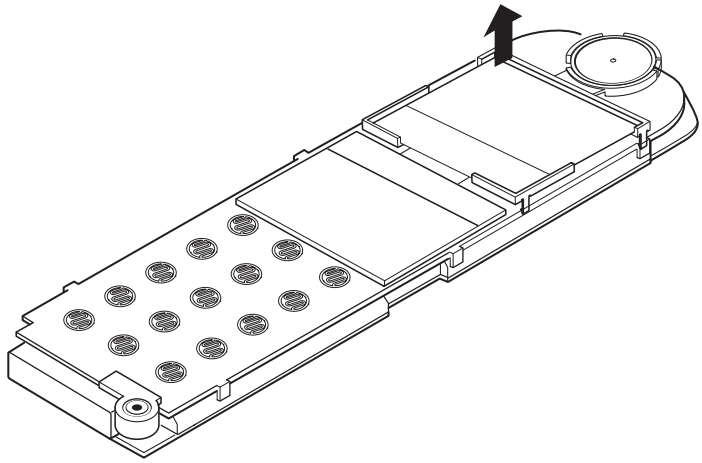

Figure 10: LC earpiece hol er re oval 450-0510

11. igure 11 isconnect the LC ro the logic C

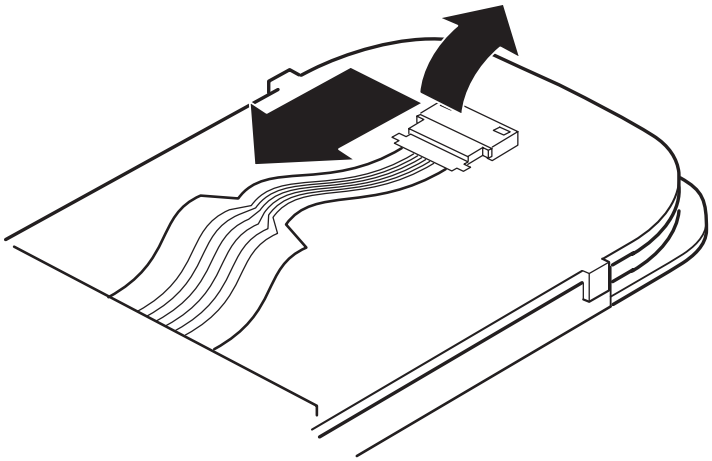

Figure 11: LC isasse bly 2 450-0511

5.2.2 Reassembly

1. igure 12 Care ust be taken hen reinstalling the back onto the telephone case Ensure that the securing scre s are not over-tightene as this ay a ect the operation o the keypa

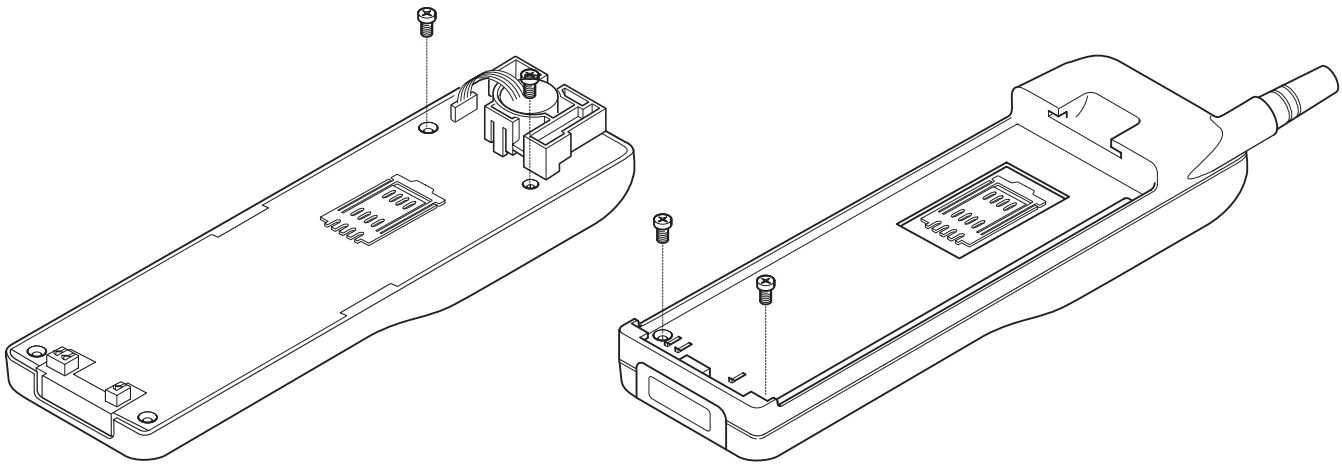

Figure 12: Case reasse bly 450-0512

5.3 Dual Charger

5.3.1 Disassembly

1. igure 13 lace the ual Charger upsi e- o n on a lat ork sur ace Re ove the t o case scre s

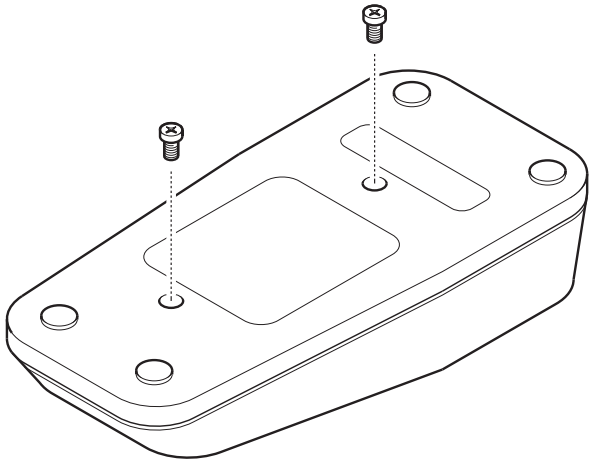

Figure 13: Case scre re oval 500-0518

2. igure 14 Re ove the case ro the cover asse bly

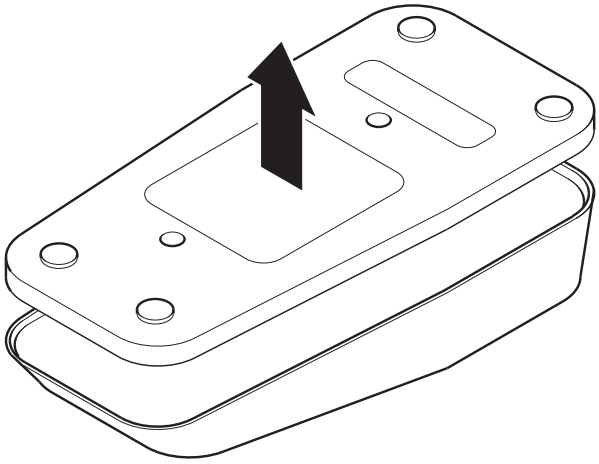

Figure 14: Case re oval 500-0519

3. igure 15 Re ove the C asse bly i ing scre s

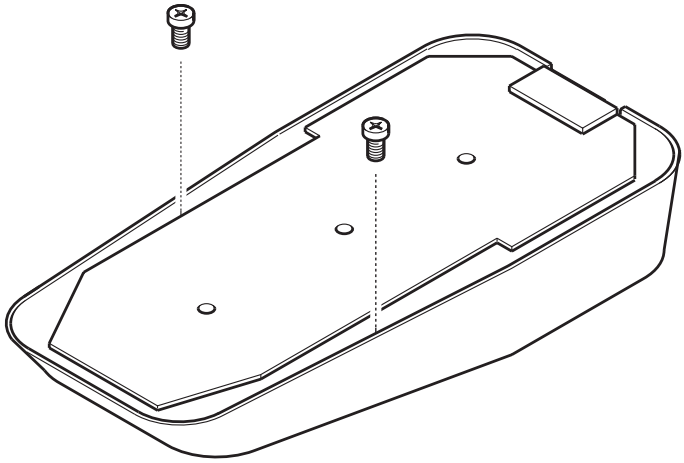

Figure 15: Scre re oval 500-0520

4. igure 16 Raise an tilt the charger C to e pose the connector cable

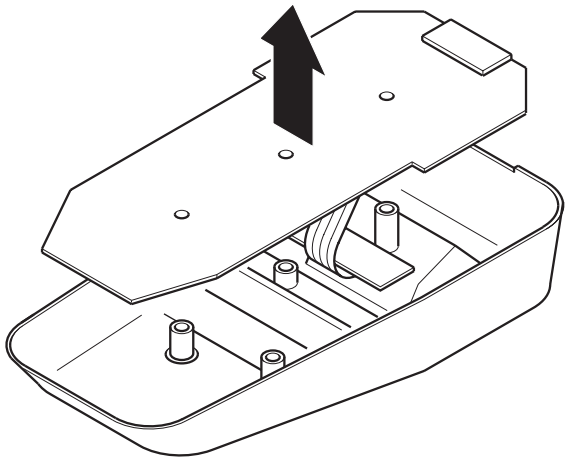

Figure 16: Charger C re oval 1 500-0521

5. igure 17 isconnect an re ove the charger C

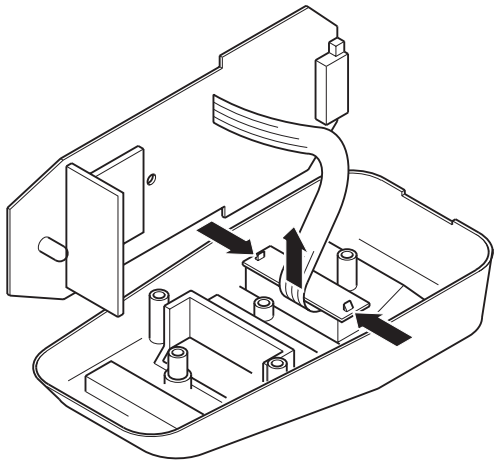

Figure 17: Charger C re oval 2 500-0522

5.4 Handsfree Unit

5.4.1 Disassembly

1. igure 18 Re ove the hol er ro the han s ree unit 4 scre s

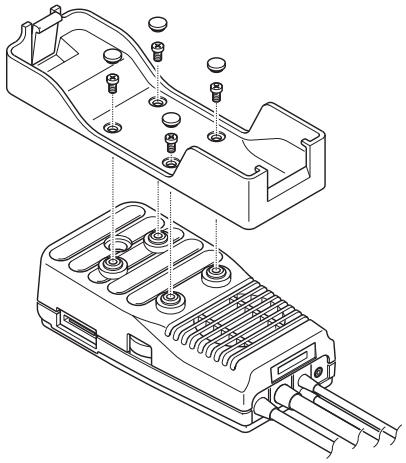

Figure 18: ol er re oval 500-0523

2. igure 19 Re ove the ront cover ro the han s ree asse bly by re oving the cover securing scre an isconnecting the speaker lea ro the han s ree C

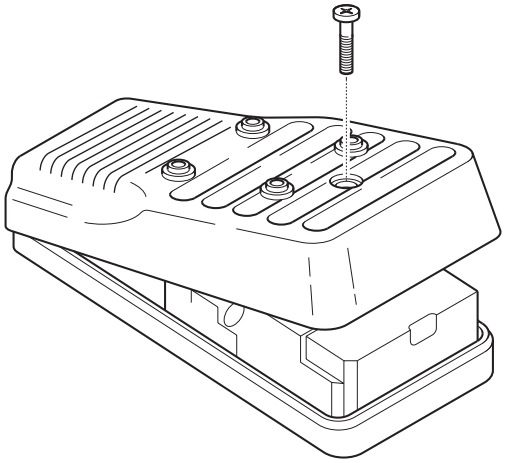

Figure 19: an s ree cover re oval 500-0524

3. igure 20 Re ove the han s ree C 3 scre s

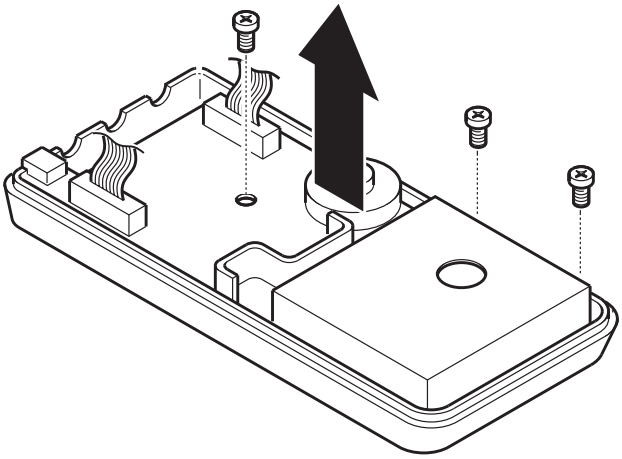

Figure 20: an s ree C re oval 500-0525

5.4.2 Reassembly

1. igure 21 Reinstall the han s ree C into the case 3 scre s

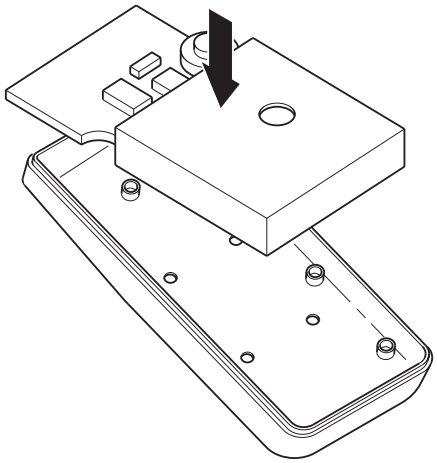

Figure 21: an s ree C reinstallation 500-0526

2. igure 22 osition the cables into the case oul ing

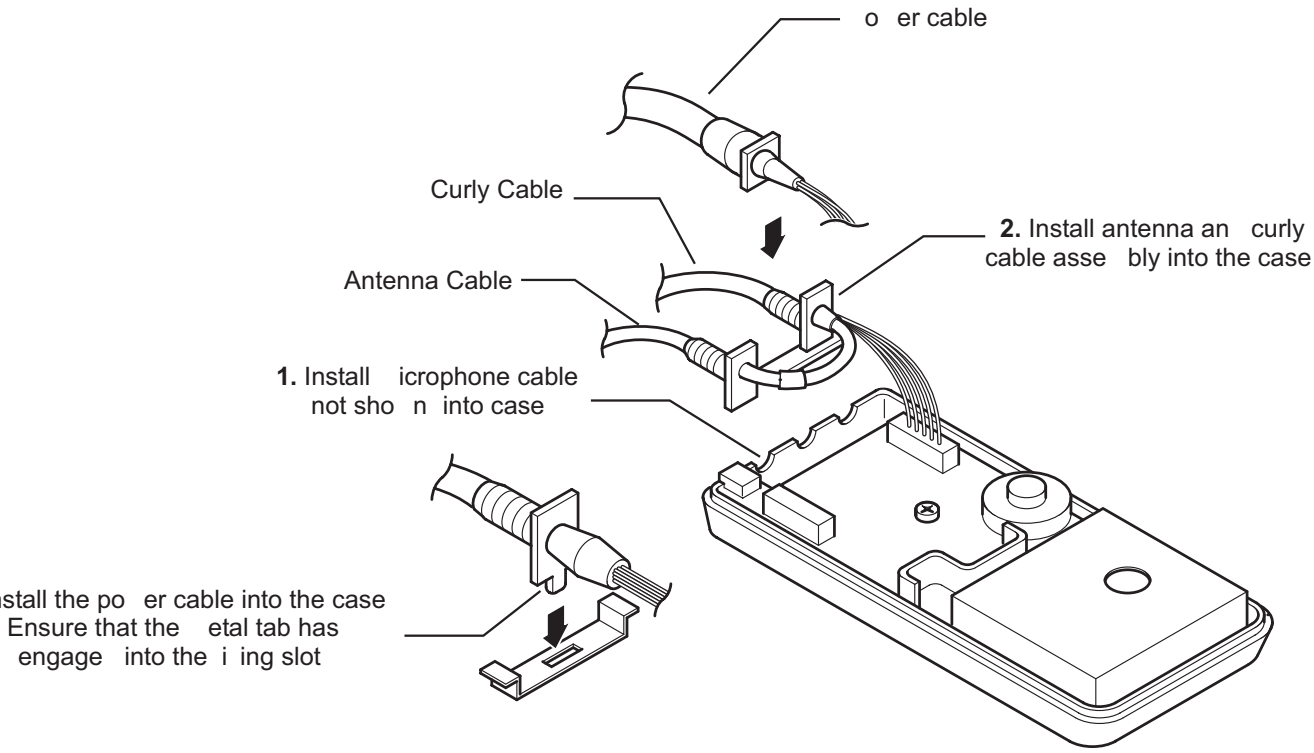
o er cable
Curly Cable
2. Install antenna an curly cable asse bly into the case
Antenna Cable
1. Install icrophone cable not sho n into case
3. Install the po er cable into the case Ensure that the etal tab has engage into the i ing slot

Figure 22: an s ree cable positioning 500-0527

4. igure 23 Reinstall the ront cover onto the han s ree asse bly by reconnecting the speaker lea onto the han s ree C an reinstalling the cover securing scre

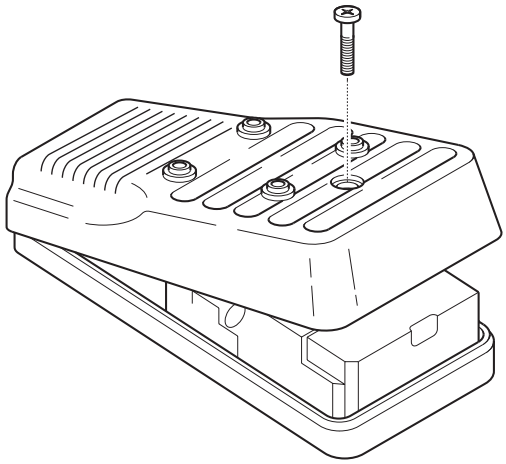

Figure 23: an s ree cover re oval 500-0524

5. igure 24 Reinstall the hol er onto the han s ree unit 4 scre s

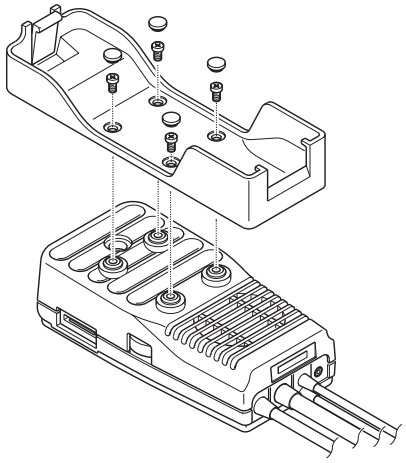

Figure 24: ol er re oval 500-0523

6 TECHNICAL SPECIFICATIONS

6.1 General

1	re uency range	T 890 - 915M R 935 - 960M
2	T R re uency separation	45M
3	R channel ban i th	200k
4	u ber o R channels	124
5	Speech co ing	ull rate
6	perating te perature	-20 C to 55 C

6.2 Handportable Unit

6.2.1 General

Unless state these speci ications are ith attery ack S2 itte
attery li e igures are epen ant on net ork con itions

1	Type	Class 4 an hel GSM hase 2
2	i ensions	eight 141 i th 46 epth 25
3	olu e	165cc
4	eight	175g
5	isplay	Chip on glass li ui crystal Alphanu eric 12 3 characters 4 icons an 6 1 characters
6	Illu ination	Green 4 LE s or the LC 10 LE s or the keyboar s 1 LE Inco ing call Re 1 LE Charging in icator
7	Keypa	17 keys an avigation key
8	SIM	lug-in type only
9	attery	4 8
10	Stan by attery Li e R 5 ECTEL reco en ation	attery ack S upto 35 hrs attery ack S2 upto 38 hrs attery ack M upto 50 hrs attery ack L upto 90 hrs
11	Conversation attery Li e L 7 T 50 E TEL reco en ation	attery ack S 140-190 inutes attery ack S2 150-210 inutes attery ack M 195-270 inutes attery ack L 370-510 inutes

12	E ternal C Supply oltage	6 7
13	Antenna Ter inal I pe ance	50Ω
14	Antenna S R	2 1 1
15	R utput o er	2 a i u GSM class 4
16	Mo ulation	GMSK T 0 3
17	Connection	8 ch T MA
18	oice igiti ing	13kbps R E-LT
19	Trans ission spee	270 3 kbps
20	iversity	re uency hopping
21	Signal Reception	ouble superhetero yne
22	Inter e iate re uency	1st 1136 - 1161 M 2n T 246 M R 201 M

6.2.2 Tx Characteristics

1. re uency error 0 1pp a relative to base station re uency

2. Mo ulation phase error RMS 5
eak 20

3. utput R Spectru ue to Mo ulation

Offset from Centre Frequency (kHz)	Maximum Level Relative to the Carrier (dB)
100	0 5
200	-30
250	-33
400 to 1800	-54 Integral antenna

4. utput R Spectru ue to S itching Transients

Offset from Centre Frequency (kHz)	Maximum Level (dBm)
400	-23
600	-26
1200	-32
1800	-36

Measure ent con itions or output R spectru easure ents

re uency Span 0
Measure ent an i th 30k
i eo an i th 100k
eak ol

5. Spurious E issions at the Antenna Connector

Frequency (MHz)	Limits (dBm)		Measurement BW (kHz)	Video BW (kHz)
	Active Mode	Idle Mode		
set ro carrier in T ban 1 8 6 0	 -36 -36		 30 100	 100 300
set ro T ban e ge 2 0 5 0 10 0 20 0 30 0	 -36 -36 -36 -36 -36		 30 100 300 1M 3M	 100 300 1M 3M 10M
re uency ban s 935 - 960 925 - 935 1805 - 1880 0 009 - 1000 1710 - 1785 1805 - 1880 1000 - 12750	 -79 a b -67 a b -71 a b	 -57 -57 -57 -47	 100 100 100 100 100 100 100	 100 100 100 100 100 100 100

Measure ent con itions
eak ol
Mo ulate Carrier
a Measure ent average over a burst an then average again over 50 bursts
b In each o the ban s 925-960 M an 1805-1880 M up to 5 spurii easure ents can ail these li its in hich case the li it -36 shall apply

6. utput Level yna ic peration

Power Control Level (defined by GSM 05.05)	Peak Power (dBm)	Tolerance for Conditions (dB)	
		Normal	Extreme
5	33	2	2 5
6	31	3	4
7	29	3	4
8	27	3	4
9	25	3	4
10	23	3	4
11	21	3	4
12	19	3	4
13	17	3	4
14	15	3	4
15	13	3	4

7 Resi ual eak o er 70 c 300k

6.2.3 Rx Characteristics

1. Sensitivity

The re erence sensitivity per or ance in ter s o ra e erasure bit error or resi ual bit error rates hichever is appropriate is speci ie in the ollo ing table accor ing to the propagation con ition

PROPAGATION CONDITIONS					
Type o Channel	Static	TU50 no	TU50 i eal	RA250 no	T100 no
TC S ER Class Ib R ER Class II R ER	0 1 0 4 2	6 0 4 8	3 0 3 8	2 0 2 7	7 0 5 9

The re erence sensitivity level is -102

NOTE:

1 1 6 The value o can be i erent or each channel con ition but ust re ain the sa e or ER an class Ib R ER easure ents or the sa e channel con ition

2. locking

Interferer Frequency (MHz)	Interferer Level (dBm)
set ro ante carrier in ban 915 - 980M 600k 800k 1 6M	 -43 -33 -23
ut o ban re uency ban s 0 1 - 915 980 - 12750	 0 0

Measure ent Con itions
ante carrier is 3 above re erence sensitivity
Inter erer is C

Spurious response e ceptions
6 e ceptions are per itte I ban 915 - 980M
24 e ceptions are per itte UTSI E ban 915 - 980M

3. Inter o ulation Characteristics

Interferer Level (f1 & f2) dBm	Interferer Frequencies (f1 & f2)
-49	ante re uency 2 1 - 2 an 2 - 1 800k

6.3 Handsfree Unit

This speci ication is applicable to the an s ree Car Kit an Easy it an s ree Car Kit

Input voltage	13 8 20
ver voltage protection	18 1 0
Current consu ption	peration 2 0A a nor al soun I le o e 150 A a no soun Stan by 1 A a logic po er o
Ignition signal	Level L Level
Speaker output po er	1 5
Speaker i pe ance	8Ω
Antenna o e	E ternal antenna
perating te perature range	-10 to 55 C
Storage te perature range	-20 to 60 C
Charging te perature range	-5 to 35 C

6.4 Dual Charger

Input voltage	8 a i u
Input current	700 A
Charging slots	ront Main unit Rear attery pack only
Charge ti e ront slot	attery ack S 120 inutes attery ack S2 120 inutes attery ack M 150 inutes attery ack L 300 inutes
Charge ti e rear slot	attery ack S 4 hours attery ack S2 4 hours attery ack M 4 hours attery ack L 10 hours
Charge in icator ront slot Telephone isplay	Charging En o charge telephone En o charge telephone
Charge in icator rear slot	Re LE Charging Green LE En o charge
Charge current	210 10 A
perating te perature range	5 to 35 C
Storage te perature range	-20 to 60 C
Charging te perature range	5 to 35 C

6.5 AC Adaptor

Input voltage	UK EU 230 AC 10 T 110 AC 10 C 100 AC 10
Input current	20 A a i u
Input plug type	UK Type EU Type C-4 C-7 ther Country speci ic
utput voltage	6 7 C
utput current	600 A a i u
Ripple voltage	50 peak to peak at 600 Ah
Charge ti e	attery ack S 80 inutes attery ack M 130 inutes attery ack L 240 inutes
utput connector	M 138-MA75-165-C L
perating te perature range	5 to 40 C
Storage te perature range	-20 to 60 C
Charging te perature range	5 to 35 C

6.6 DC Adaptor

This speci ication is applicable to the C A aptor an Si ple Car Kit

Input voltage	13 8 C 20 egative earth only
utput voltage	7 2 C $^{0}_{-10}$
Current consu ption	peration 500 A Stan by 34 A a no loa
Charge ti e	attery ack S 120 inutes attery ack M 150 inutes attery ack L 270 inutes
isplay	Re LE po er status
Reverse voltage protection	io e across input
Short circuit protection	Input 2A use utput 8 2 ener io e
perating te perature range	5 to 60 C
Storage te perature range	-20 to 80 C
Charging te perature range	5 to 35 C

6.7 Battery Packs

6.7.1 Battery Pack (S2)

Type	i-M 4 cells
eight	80 2g
oltage	4 8
Capacity	650 Ah
Storage te perature range	-20 to 40 C 6 onths

6.7.2 Battery Pack (S)

Type	i-M 4 cells
eight	90 2g
oltage	4 8
Capacity	600 Ah
Storage te perature range	-20 to 40 C 6 onths

6.7.3 Battery Pack (M)

Type	i-M 4 cells
eight	115 2g
oltage	4 8
Capacity	850 Ah
Storage te perature range	-20 to 40 C 6 onths

6.7.4 Battery Pack (XL)

Type	i-M 4 cells
eight	145 2g
oltage	4 8
Capacity	1600 Ah
Storage te perature range	-20 to 40 C 6 onths

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7 TEST AND MEASUREMENT

7.1 Introduction

This section provi es in or ation on testing the G450 telephone The layout is as ollo s

1 Section 7 2 E ternal testing escribes e uip ent re uire ents an general set up proce ure

2 Section 7 3 Channel bo test co an s provi es etaile e planation o the i erent co an s available using the test e uip ent an channel-bo so t are

3 Section 7 4 A ust ent o e escribes a ust ents available on the G450 han hel unit

4 Section 7 5 Lock co e escribes the proce ure to check or reset the lock co e using the Channel boc so t are

5 Section 7 6 SIM personalisation escribes the proce ure to personalise the telephone to a particular SIM

7.2 External Testing

The G450 unit can be connecte to a co patible personal co puter or electronic a ust ent an ault iagnosis This section provi es a escription o the e uip ent re uire to per or those tasks
Testing an a ust ent o the han hel unit can be per or e ith the outer case in place or in- epth ault in ing the unit shoul be isasse ble section 5 an the e ten e car use to connect the C s together e ternally as they oul be oun in nor al use ault tracing can then be per or e on the C s using suitable test e uip ent such as spectru analysers an oscilloscopes

7.2.1 Jigs and Tools

Test Equipment Descriptions

1. Inter ace Unit art o I 001 igure 1

The I 001 provi es

a oltage regulation ro 12 C input ro po er supply to 7 C output

b RS 232 inter ace Ensures that the Unit Un er Test is supplie ith the correct signalling level an or at

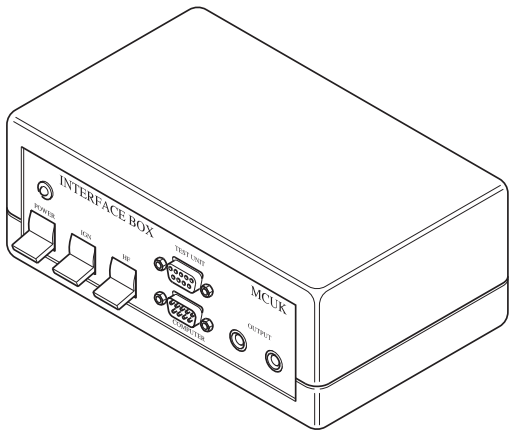


Figure 1: Inter ace o I 001 500-0701

2. ersonal Co puter C

The C I M co patible is use as a Unit Un er Test controller This in con unction ith the channel bo so t are allo s all o the test acilities nor ally provi e through the keypa o the Unit Un er Test

3. Regulator Unit art o G5I T 001 igure 2

The Regulator Unit provi es

a oltage regulation ro 7 C input ro I 001 to 5 6 or 4 8 C output The 5 6 s itch setting is use or C testing an the 4 8 s itch setting is use or testing the co plete unit

b Connection bet een I 001 an the Unit Un er Test

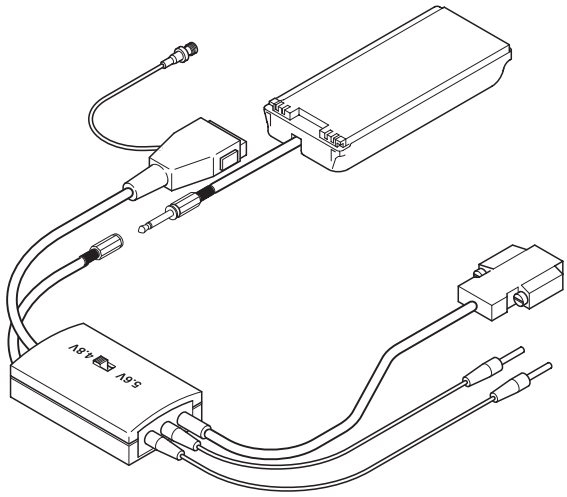


Figure 2: Regulator Unit 500-0702

4. o er Supply

rovi es 12 C supply to the Inter ace o I 001

5. E ten er C art o G5E T C 001 igure 3

The e ten er C is provi e to allo connection o the logic C to the R C hen the C s have been re ove ro the ain unit

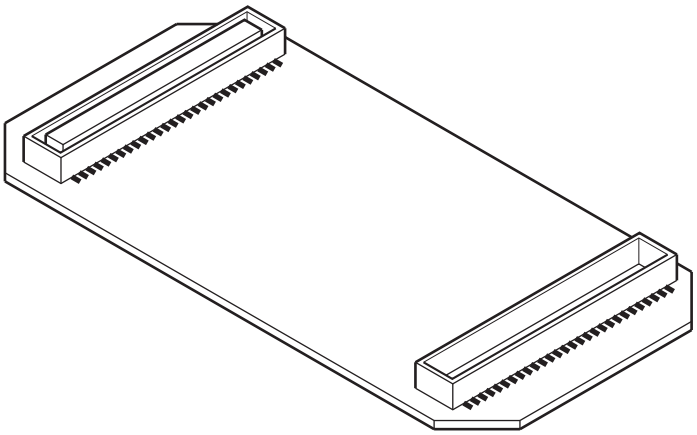


Figure 3: E ten er C 500-0703

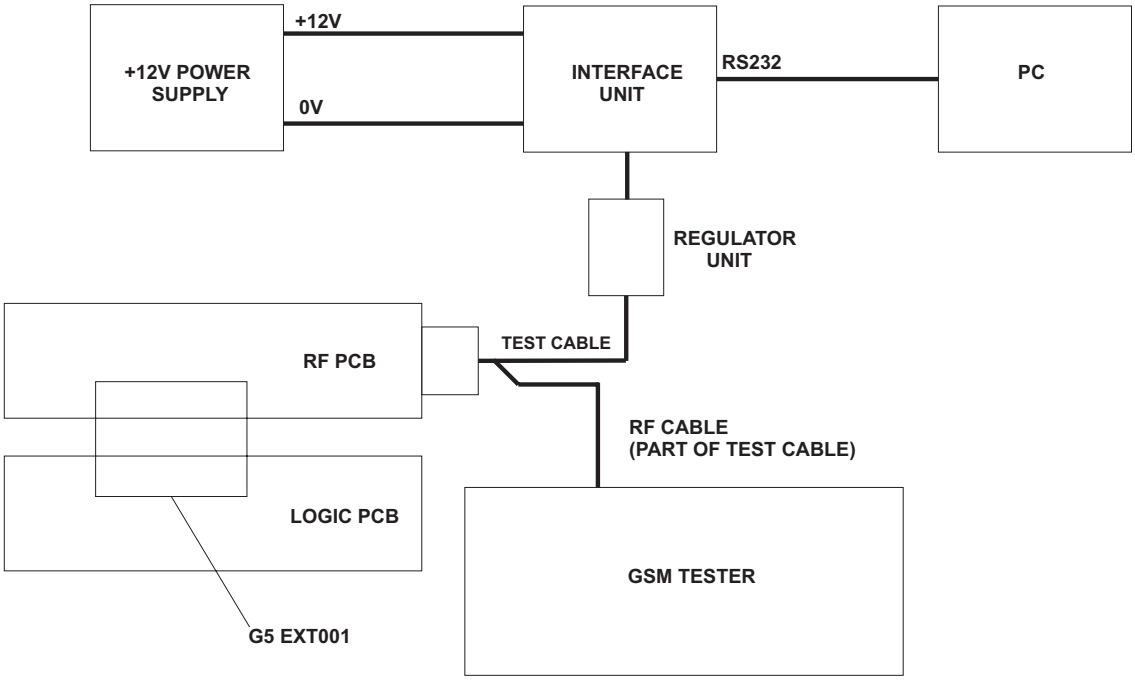
6. GSM Tester

This unit acts as a base station provi ing all the necessary GSM signalling re uire ents an also provi es GSM signal easuring acilities

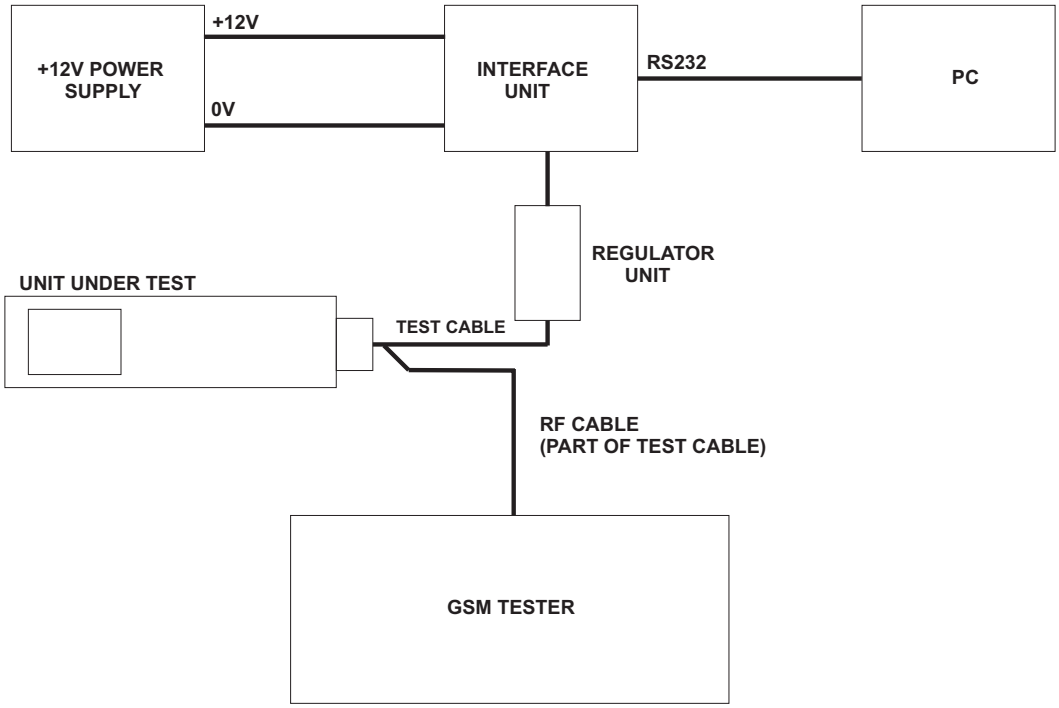
7. Channel o So t are

This is the test so t are or the G450 unit an shoul be installe onto the personal co puter use or testing

7.3 Complete Unit Test Setup



PCB TEST SETUP



COMPLETE UNIT TEST SETUP

Figure 5: Co plete unit test setup 500-0705

7.3.1 External Testing Setup Procedure

IMPORTANT NOTE:
To allo accurate easure ent o the co plete unit the test e uip ent ust be connecte as sho n igure 6 The C Test Setup ust be use to enable repair to C s nce repair replace ent is co plete the asse ble unit ust be teste an calibrate ith the igs an tools connecte as sho n in igure 6

ull Test E uip ent Re uire ents

or testing the han hel unit the ollo ing e uip ent is re uire

1 Inter ace unit

2 Regulator unit

3 12 po er supply

4 ersonal co puter I M co patible ith RS232 inter ace

5 RS232 inter ace cable 9 pin straight through connection

6 GSM test station

igure 6 sho s a typical setup or testing the G450 unit The channel bo so t are supplie on loppy isk shoul be installe onto the ain rive o the personal co puter
The R cable on the regulator unit is connecte to the GSM test station via a suitable a aptor The 12 supply is connecte to the rear socket o the inter ace unit
T o o es are available or testing the han hel unit

1 Test Mo e
The Test Mo e acility allo s various sections o the han hel unit to be in ivi ually activate

2 or al Mo e
The or al Mo e acility allo s the han hel unit to be po ere e ternally or call origination receiving operations TE A suitable test SIM car ill be re uire hich is co patible ith the GSM test station

Power On into Test Mode

1. igure 6 Connect the test e uip ent into test o e con iguration

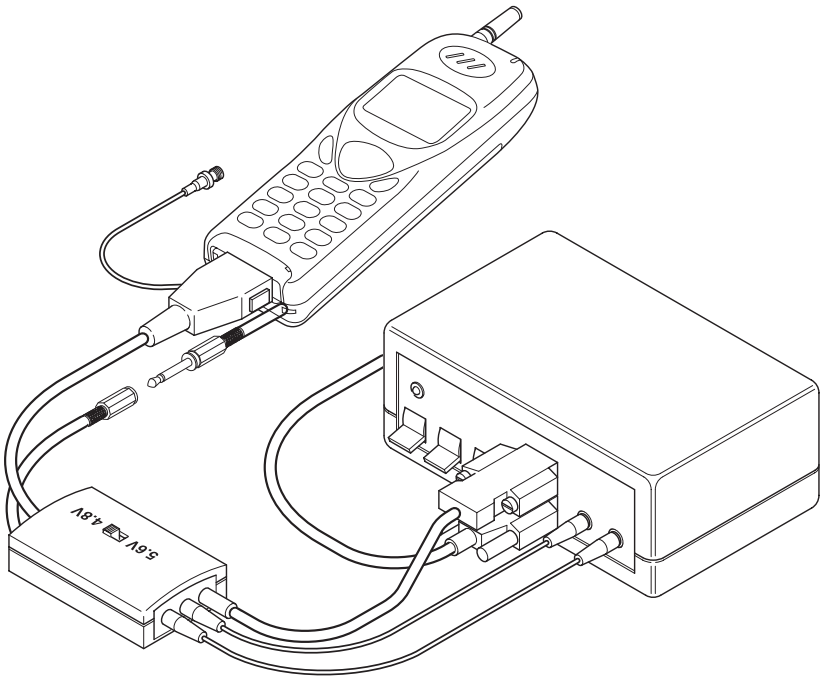


Figure 6: Inter ace Unit 450-0706

2. Ensure that the ollo ing settings are a e

a Inter ace Unit I 001
o er U position
IG position
position

b o er supply
12 C

c C
Channel bo so t are loa e an the screen in icating as sho n igure 7

Figure 7: C Screen SCR 10 450-0707

3. ress E TER on the C keyboar

4. S itch on the 12 supply

5. At the C press 10

6. At the Inter ace Unit s itch the po er to

7. Steps 5 an 6 above ust be carrie out ithin 1 secon or po er ill ti e-out

NOTE:
The UUT ill s itch an back again The isplay ill rea STAT I The back light ill be illu inate an all LE s ill be lit

Go to section 7 5 Channel o Test Co an s or urther testing in or ation

Power On in Normal Mode

1. igure 8 Connect together the test e uip ent

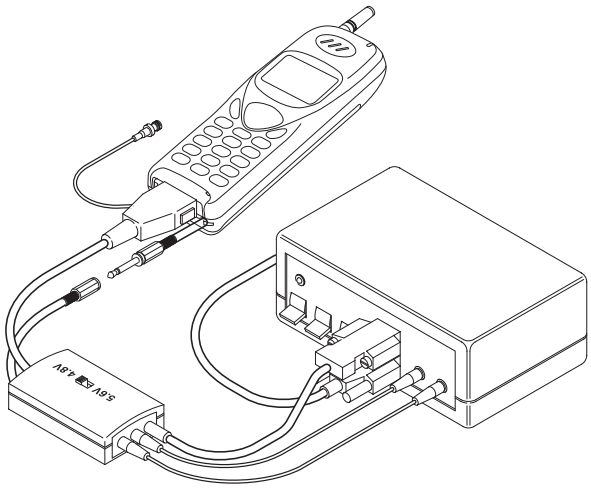


Figure 8: Inter ace Unit 450-0706

2. Ensure that the ollo ing settings are a e

a Inter ace Unit I 001
o er position
IG position
position

b o er supply
12 C

c C

Channel bo so t are loa e an the screen in icating as sho n igure 9

Figure 9: C Screen SCR 9 450-0707

3. n the C press E TER

4. S itch on the 12 supply

5. At the Inter ace Unit s itch the po er to an to

6. At the C press 10

7. At the Inter ace Unit s itch IG

Entering Call Mode from Test Mode

The screen o the C ill rese ble the one sho n in igure 10

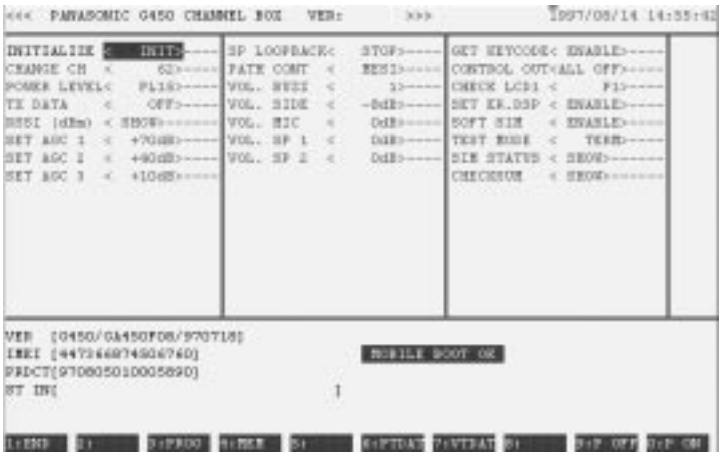


Figure 10: C Screen SCR 11 500-0710

1. At the C change the S T SIM iel to rea E ress E TER
2. At the C change the TEST iel to rea TERM ress E TER

   The UUT ill po er o n an up again I the UUT is connecte to a GSM test set a ter a elay o appro i ately 5 secon s the UUT ill register service
3. To return to test o e set S T SIM iel to IS an set TEST iel to Test ress E TER

7.4 Channel Box Test Commands

The ollo ing table outlines the co an s available using the channel-bo so t are

A ter the han hel unit has been s itche on section 7 3 use the up o n scroll keys on the personal co puter keyboar to select the channel-bo co an Use the le t right scroll keys to isplay the re uire in ication an press the E TER key to select the isplaye unction

CHANNEL BOX COMMAND	INDICATION	FUNCTION
TEST M E	TERM ReST	Ter inates test o e Restarts test o e
I ITIALI E	I IT	hen RETUR is presse this ill reset the e ault channel settings
C A GE C		Sets up pre- e ine channel settings
T R M		Sets user e ine channels or trans it Receive an onitor
R I C		revents Receive signal ro pulsing provi ing accurate test environ ent or the Receive signal Allo s RSSI easure ent to be a e
ER LE EL		Allo s a speci ie po er level to be set at the UUT
T ATA	RL 0 RL 1 RL R ACC R	Sets T Mo ulation to or al burst ATA all 0s or al burst ATA all 1s or al burst ATA all ran o Access burst ATA ran o
RSSI M		rovi es an RSSI rea ing on the User speci ie channel
SET AGC 1 SET AGC 2 SET AGC 3		Allo s changes to AGC levels on L MI LE IG channels
S L ACK	START ST	rovi es an au io path or use ith the GSM test station Sets au io loop-back ro T au io to R au io ithout processing by the C EC
AT C T	M S MESI MESE MISI MISE	Sets au io paths MIC o speaker o MIC e ternal speaker internal MIC e ternal speaker e ternal MIC internal speaker internal MIC internal speaker e ternal

CHANNEL BOX COMMAND	INDICATION	FUNCTION
L U		Sets bu er volu e bet een values 0 to 3 Min to Ma
L SI E		Sets 4 si e tone volu e levels bet een 0 an -18
L MIC		Sets 8 MIC volu e levels bet een 26 an 40
L S 1		Sets speaker pre-a p volu e levels
L S 2		Sets speaker volu e levels
GET KE C E	E A LE ISA LE	isplays the value o a key presse on the keypa
C TR L UT	LE R LE C ARGE LE C ALL ALL	S itches on Inco ing LE S itches on acklight LE s S itches charge se uence on LC S itches on Charging LE S itches on han s ree o e S itches o all above S itches on all above
C ECK LC 1	1 2	rovi es 50 visual isplay o check pattern on the UUT LC rovi es 50 visual isplay o check pattern on the UUT LC
TEST S TST	E	ith E set an TEST M E TERM test co an s can be entere ro the key pa o the UUT
SET ER IS	E A LE ISA LE	Unit error co es ill be isplaye on the UUT isplay Unit error co es ill not be isplaye on the UUT isplay
S T SIM	E A LE ISA LE	ith E A LE set an TEST M E TERM the UUT is re ove ro test o e an can be place into call o e
TEST M E	TERM	ith S T SIM E A LE the UUT ill be re ove ro test o e an can be place into a call
SIM STATUS	S	Checks an isplays the SIM status
C ECK SUM	S	isplays the so t are check-su

7.5 Adjustment Mode

NOTE:
See section 7 2 1 or a list o the e uip ent an setup proce ures re uire to per or the ollo ing a ust ent an calibration proce ures

The ollo ing proce ures MUST be per or e a ter replace ent or repair o one or both o the C s in the han hel unit ailure to o so ay result in incorrect operation o the telephone

The ollo ing a ust ents MUST be a e on AR AIRS

There are our istinct calibration proce ures to a ust R per or ance These proce ures are
1 Ra ping gain Section 7 5 1
2 RSSI Section 7 5 2
3 I an values Section 7 5 3

The a ust ent ata selecte uring calibration is store in the telephone EE R M

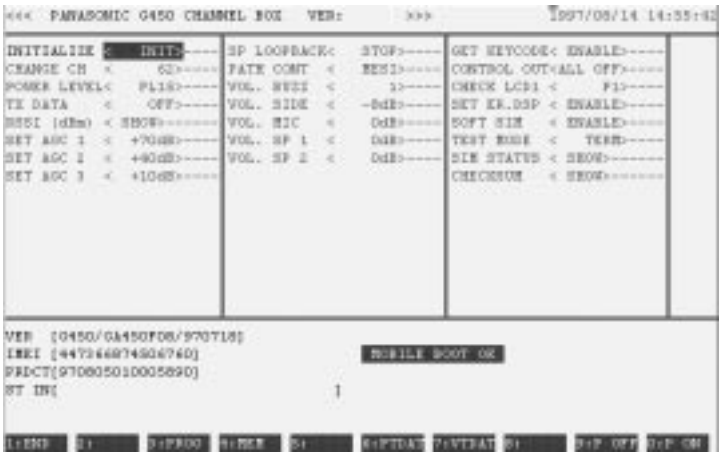


Figure 11: Test so t are screen 450-0710

7.5.1 Ramping Gain

The carrier po er ust be easure an calibrate or each po er level at channel 62

Target Power Level	Peak Power (dBm)	Tolerance (dB)	Initial Calibration Value	Change per dB
L5	33	2	128	29
L6	31	3	128	15
L7	29	3	128	11
L8	27	3	128	8
L9	25	3	128	7
L10	23	3	128	6
L11	21	3	128	5
L12	19	3	128	4
L13	17	3	128	3
L14	15	3	128	3
L15	13	3	128	2
L16	11	3	128	2

Target Power Level	Peak Power (dBm)	Tolerance (dB)	Initial Calibration Value	Change per dB
L17	9	3	128	2
L18	7	3	128	1
L19	5	3	128	1

Calibration of output power on each power level

To be able to calibrate the ra ping gain it is irst necessary to s itch the unit into Test Mo e section 7 3

This proce ure ust be ollo e or all po er levels L5- L19 or lo e iu an high channels

1. Set the C controls to Channel 62 at o er Level 5 nor al burst o ulate ith ran o ata as ollo s

a ress the o n arro until C A GE C 62 is highlighte an then press E TER

b ress the o n arro until L L19 is highlighte ress the ove le t arro until 5 appears in the highlighte iel ress E TER

c igure 12 ress the o n arro until T ATA is highlighte ress the ove arro until RL R
appears in the highlighte iel ress E TER

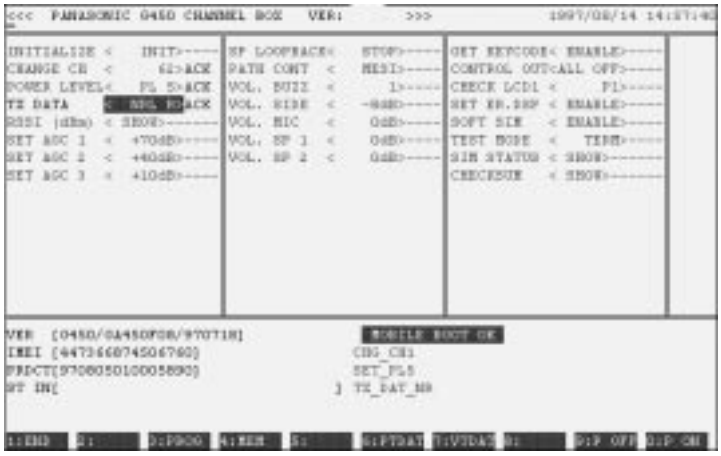


Figure 12: T ata iel 450-0712

2. At the GSM test unit easure the eak o er

3. I the easure po er is in the range o the target po er see previous table then procee to step 10

4. ress 7 to vie the TRIM or the i channel Make a note o this value

5. er or the ollo ing calculation

Set Rgain L5 alue recor e in step 4 change in L to eet speci ie value or Change per

Make a note o the ans er

6. igure 13 At the C press 6 to progra the TRIM or the i channel

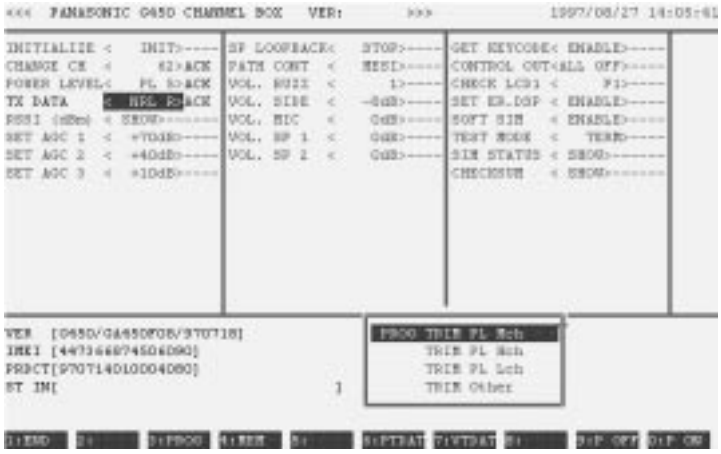


Figure 13: o er level selection 1 450-0713

7. igure 14 ighlight the L5 iel an press E TER

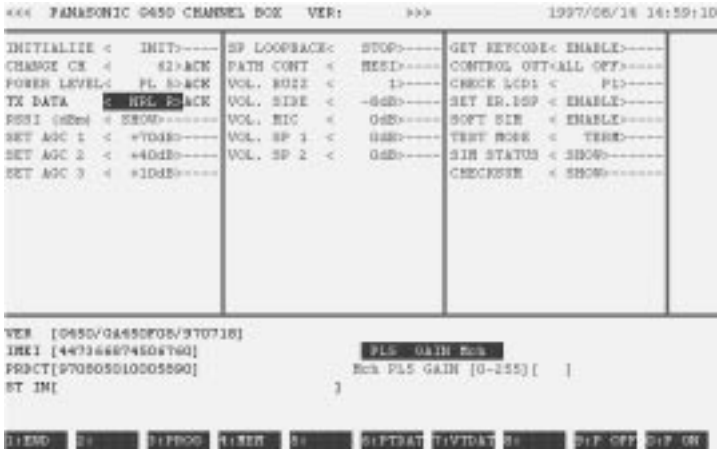


Figure 14: o er level selection 2 450-0714

8. Enter the value calculate in step 4 into the ata iel an then press E TER

9. ress ESC

10. At the GSM test unit re- easure the eak o er

11. Repeat steps 2-9 o this proce ure or po er levels L6 to L19

12. A ter calibrating at channel 62 the carrier po er ust be easure an calibrate at lo an high channels or po er level 5 to 19

7.5.2 RSSI

This proce ure escribes the calibration o RSSI on the i channel Mch Ch 62 This process ust be carrie out or Lo Channel Mi Channel an igh Channel The ollo ing channel settings are use in this proce ure

1. Set up the test e uip ent as escribe in Section 7 3 an s itch the unit into test o e as escribe
2. Apply a carrier re uency o 68K to the UUT or Ch 62 947 468M at an input level o -60
3. At the C highlight the C A GE C 62 iel an press E TER
4. ighlight the SET AGC 2 iel an change the set value to 36 an press E TER
5. igure 15 ighlight the RSSI iel an press E TER

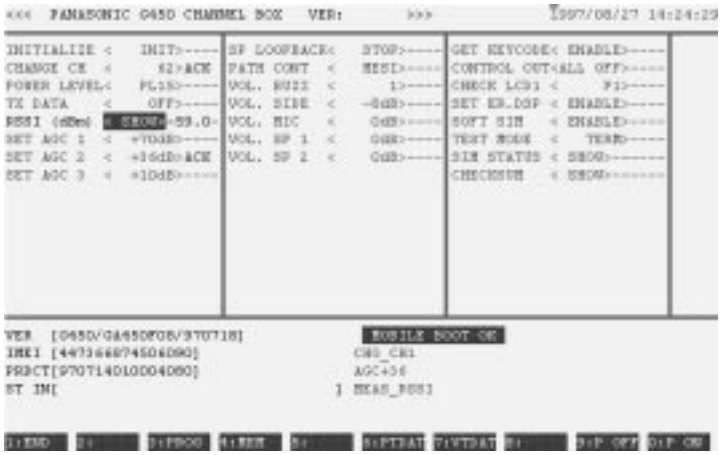


Figure 15: RSSI iel 450-0715

6. I the easure value is not 60 2 then ake the ollo ing calculation
   RSSI o set value - 60 MEASURE RSSI ALUE or e a ple - 60 -75 15
   Recor the result
7. igure 16 At the C press 7 select TRIM other Make a note o the RSSI on the easure channel rea ing ress ESC

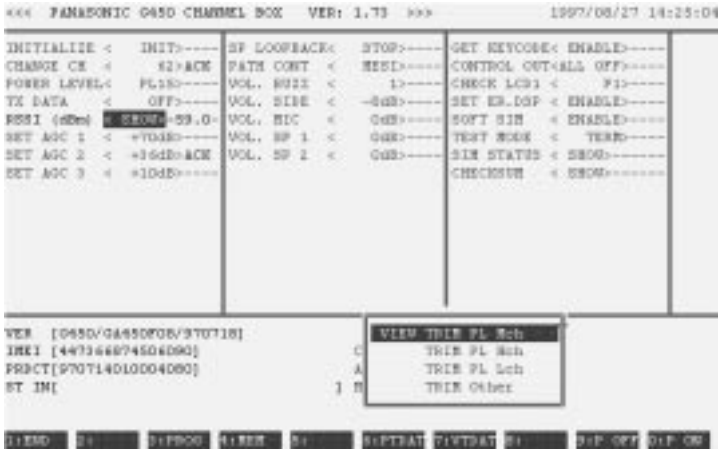


Figure 16: RSSI rea ing 1 450-0716

8. igure 17 At the C press 6 an highlight progra TRIM other ress E TER

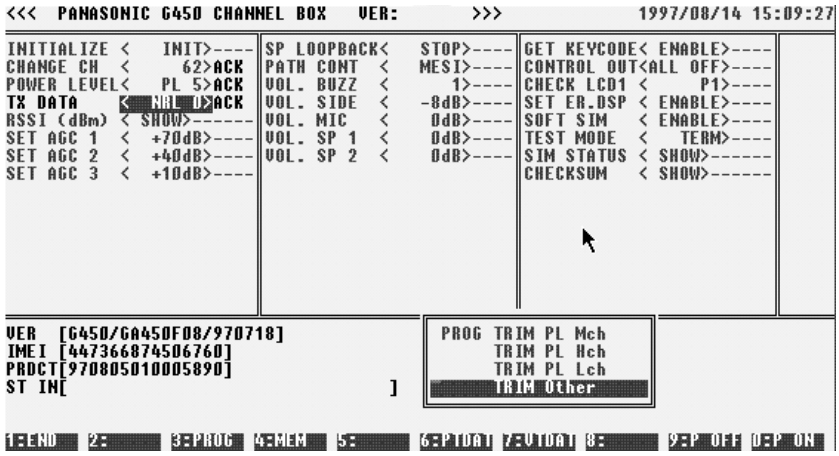


Figure 17: RSSI rea ing 2 450-0717

9. Make the ollo ing calculation RSSI SET ALUE ro step 8 REA I G TE I STE 6 Enter the result into the RSSI M iel or e a ple 15 5 20

11. ress E TER

12. ress ESC

13. Measure the RSSI level again by highlighting the RSSI iel an pressing E TER

Repeat this proce ure or the calibration o both Lo an igh channels

7.5.3 I and Q Values

NOTE:
ith the I ch a ust ent proce ures the trans itter ust be set to o er Level 5 this presents the orst case o non-linearity so care ust be taken that the spectru analyser use can accept a signal input o 33 I not an appropriate attenuator ust be use

I, Q ch Offsets

Spectru Analy er setup
centre re uency 902 4M
R 10k
1k
span 1M
s eep ti e 2sec

1. Set the C controls to channel 62 at po er level 5 nor al burst o ulate ith all 0 s

a ress the o n arro until C A GE C is highlighte an then press E TER

b ress the o n arro until L is highlighte ress E TER

c igure 19 ress the o n arro until T ATA is highlighte ress the ove arro until RL 0 appears in the highlighte iel ress E TER

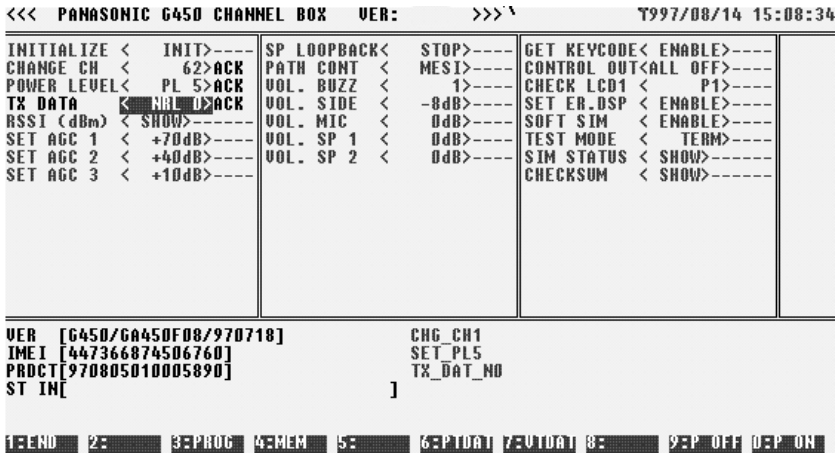


Figure 19: C setup 500-0719

2. igure 20 n the spectru analyser easure the carrier leakage ratio Carrier leakage ratio is easure as the ratio o peak po er an the po er at 68k belo peak re uency
E a ple
peak po er 902 468M 33
po er at 68k belo peak po er 0
carrier leakage ratio 33 - 0 33

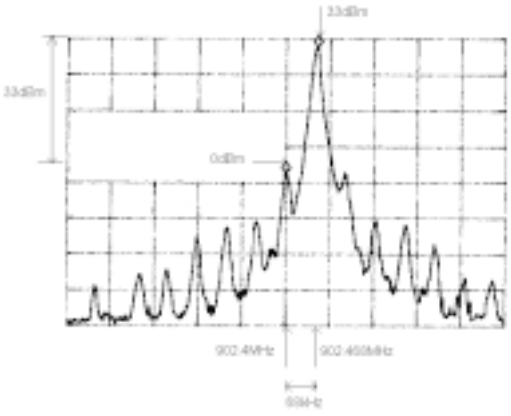


Figure 20: Carrier leakage ratio 500-0720

3. I carrier leakage ratio is greater than 30 c then unit is K o set calibration is co plete

4. I carrier leakage ratio less than 30 c then go to Ich check

Ich check

1. Set Ich o set to 3

a At the C press 6 an select TRIM other

b igure 21 ress ove o n arro until IC SET appears in the iel ress E TER

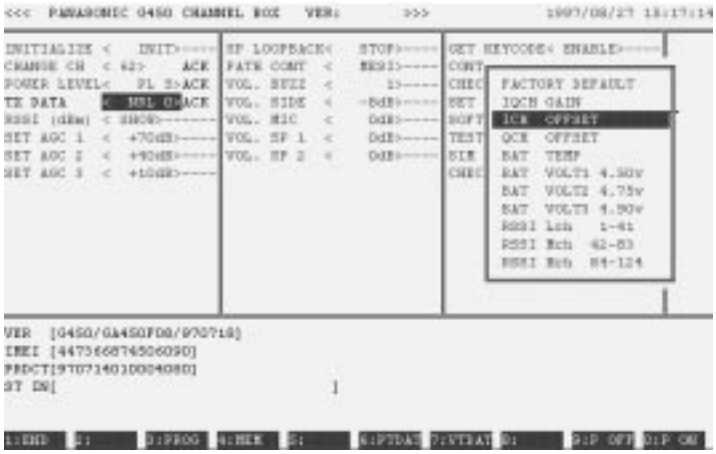


Figure 21: I ata iel selection 450-0721

c igure 22 Enter a higher or lo er nu ber as appropriate into the ata iel an press E TER

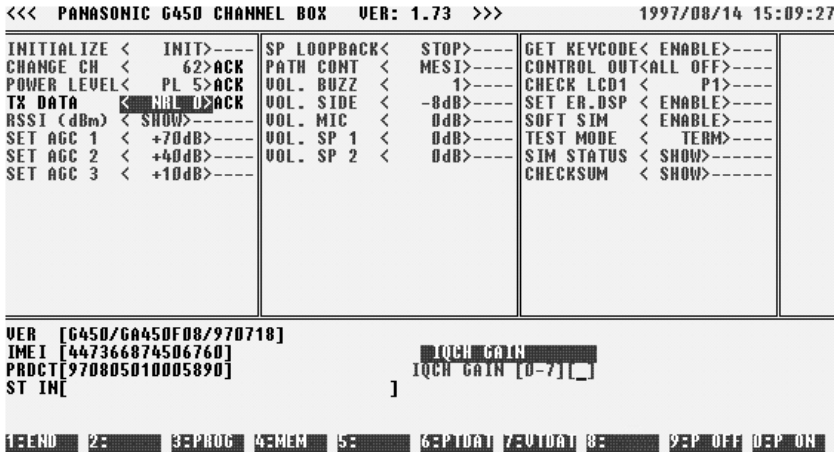


Figure 22: I ata iel 450-0722

2. Using the spectru analyser easure the ne carrier leakage ratio

3. I the carrier leakage ratio is greater than 30 c then the unit is K o set calibration is co plete

4. I the original carrier leakage ratio see I ch ests step 2 is greater than the ne carrier leakage ratio go to I ec Calibration

5. I the original carrier leakage ratio is less than the ne carrier leakage ratio go to I Inc Calibration

I Dec Calibration

1. Set Ich o set to 127 see Ich Check step 1

2. Using the spectru analyser easure the ne carrier leakage ratio

3. I the carrier leakage ratio is greater than 30 c then unit is K o set calibration is co plete

4. I not then repeat steps 1 2 an 3 above or Ich o set values 58 55 52 49 46 43

5. I the carrier leakage ratio is still not greater than 30 c then go to ch Check

I Inc Calibration

1. Set Ich o set to 3 see Ich check step 1

2 Using the spectru analyser easure the carrier leakage ratio

3 I the carrier leakage ratio is greater than 30 c then the unit is K o set calibration is co plete

4. I not then repeat steps 1 2 an 3 above or Ich o set values 9 12 15 18 21

5. I the carrier leakage ratio is still not greater than 30 c then go to ch Check

Qch Check

1. Set Ich o set to 0

2. Set ch o set to 3

a At the C press 6

b igure 21 ress ove o n arro until C SET appears in the iel ress E TER

c igure 22 Enter 3 into the ata iel an press enter

3. Measure the ne carrier leakage ratio

4. I the carrier leakage ratio is greater than 30 c the unit is K o set calibration is co plete

5. I the original carrier leakage ratio see I ch sets step 2 is greater than ne carrier leakage ratio then go to ec Calibration

6. I the original carrier leakage ratio is less than ne carrier leakage ratio then go to Inc Calibration

Q Dec Calibration

1. Set ch o set to 61 see ch Check step 2

2. Measure carrier leakage ratio

3. I the carrier leakage ratio is greater than 30 c then unit is K o set calibration is co plete

4. I not then repeat steps 1 2 an 3 above or ch o set values 58 55 52 49 46 43

5. I the carrier leakage ratio is still less than 30 c then unit is a ail

Q Inc Calibration

1. Set ch o set to 6 see ch Check step 2

2. Measure carrier leakage ratio

3. I carrier leakage ratio is greater than 30 c then unit is K o set calibration is co plete

4. I carrier leakage ratio is less than 30 c then repeat steps 1 2 an 3 above or ch o set values 9 12 15 18 21

5. I carrier leakage ratio is less than 30 c then unit is a ail

I, Qch Gain

IM RTA T I ch o set calibration shoul be one be ore this calibration
Spectru Analyser Setup
centre re uency 902 4M
R 10k
1k
span 1M
s eep ti e 2sec

1. Set the C controls to channel 62 at po er level 5 nor al burst o ulate ith all 0 s

a ress the o n arro until C A GE C is highlighte an then press E TER

b ress the o n arro until L is highlighte ress E TER

c ress the o n arro until T ATA is highlighte ress the ove arro until appears in the highlighte iel ress E TER

2. igure 23 Using the spectru analyser easure the i age leak ratio I age leak ratio is the easure ratio o peak po er an the po er at 135k belo peak re uency
E a ple
peak po er 902 468 h 33
po er at 135k belo peak po er -9
i age leak ratio 33 - -9 42

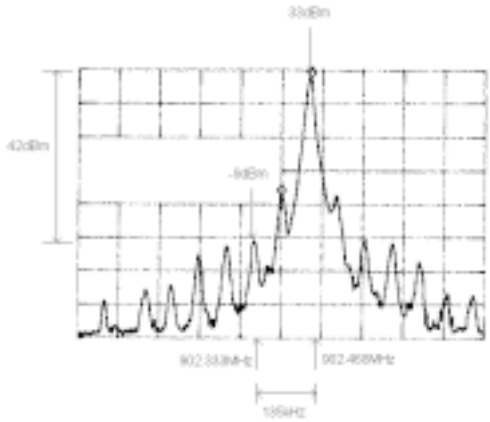


Figure 23: I age leak ratio 500-0723

3. I i age leak ratio is greater than 30 c then unit is K o set calibration is co plete

4. I i age leak ratio is less than 30 c then go to Ich gain calibration

IQch Gain Calibration

1. Set I ch gain to 0

a n the C press 6

b igure 21 ress ove le t arro until I C GAI iel is highlighte ress E TER

c igure 22 Enter 2 into the ata iel ress E TER

2. Measure the i age leak ratio

3. I i age leak ratio is greater than 30 c then unit is K o set calibration is co plete

4. I i age leak ratio is less than 30 c then repeat steps 1 2 an 3 above ith I ch gain values 1 2 3 4 5 6 an 7

5. I i age leak ratio is still less than 30 c then go to ch gain calibration

7.5.4 Simple Receiver Test

The ollo ing proce ure gives a etho by hich the Unit Un er Test UUT can be place into a con ition allo ing the service technician to probe the entire receive R path Input level an re uency can also be speci ie

To per or the ollo ing proce ure the UUT ust irst be place into Test Mo e er or the ollo ing steps

1. At the C highlight the C A GE C iel an set the re uire test channel ress E TER

2. ighlight the SET AGC 1 2 3 iel an enter the re uire gain value

3. At the GSM test unit input an R signal at the re uire re uency an level

The unit has no been place into a state hich ill allo the receive signal path to be onitore

7.5.5 Simple Transmitter Test

The ollo ing proce ure gives a etho by hich the Unit Un er Test UUT can be place into a con ition allo ing the service technician to probe the entire trans it R path Input level an re uency can also be speci ie

To per or the ollo ing proce ure the UUT ust irst be place into Test Mo e er or the ollo ing steps

1. ighlight the C A GE C iel an set the re uire test channel

2. ress E TER

3. ighlight the L iel an set the re uire test po er level

4. ress E TER

5. ighlight the T ATA iel an select the re uire o ulation type an ata

6. ress E TER

The UUT is no in the re uire state to allo probing o the trans it R path

7.6 Lock Code

NOTE:
See section 7 2 1 or a list o the e uip ent an setup proce ures re uire to per or the ollo ing a ust ent an calibration proce ures

To per or the ollo ing proce ures the UUT ust be place into Test Mo e

7.6.1 Check current lock code

1. igure 24 At the C press 4 an highlight IE L CK C ITI ress E TER

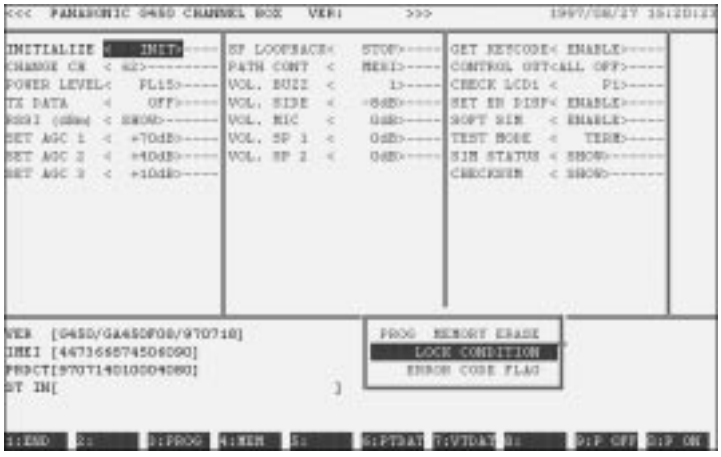


Figure24: ie lock co e 450-0724

2. The isplay ill sho the current lock status an lock co e or the UUT

7.6.2 Change current lock code

1. At the C press S I T an 4 an highlight R G L CK C ITI ress E TER

2. igure 25 ress E TER to unlock the UUT The current lock co e ill be use

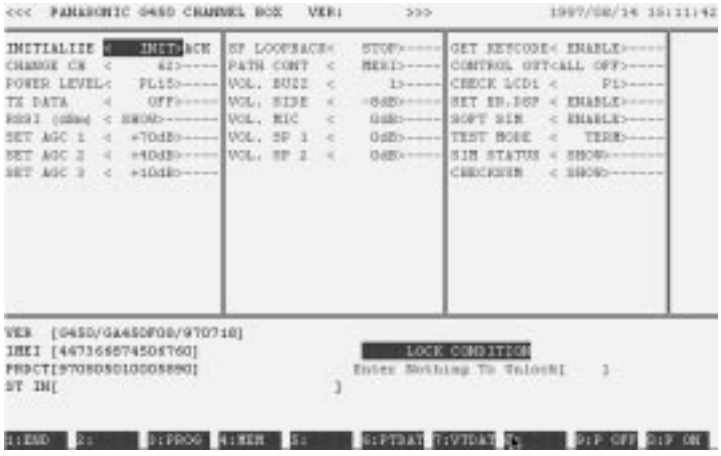


Figure 25: rogra lock co e 450-0725

3. Enter 0000 to reset the UUT to actory e aults The UUT ill be locke using the lock co e 0000

7.7 SIM Personalisation

Introduction

SIM personalisation ill li it the use o G450 to a single SIM a SIM supplie by one et ork Sub-net ork Service rovi er or a SIM purchase by a co pany corporation I a personalise G450 contains a SIM that is ro a i erent source it ill isplay the essage SIM ERR R hen s itche on This personalisation o G450 is so eti es re erre to as SIM lock or SIM latch

Testing

To test a personalise G450 hen the user has not supplie the SIM a SIM con igure or test purposes e g test SIM or so t SIM shoul be use The obile ill recognise that the SIM is or testing purposes only an operate as nor al

Personalisation Function

ersonalisation is activate uring anu acture an then enable at a later stage Enabling isabling is available by entering special key se uence i e iately a ter po er on nce the enable isable enu is sho n it is possible to select the type o personalisation hen personalisation is enable it is only possible to isable it i the obile contains an illegal SIM an the si teen igit Control Key CK is kno n hen enable by the CK is ithhel ro the user an cannot be rea or security reasons

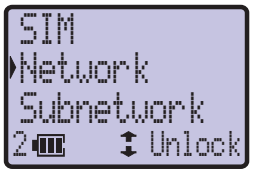
There are t o special key se uences to enter the enable isable enu

Key se uence	otes
7PQRS 4GHI 6MNO	Can only isable personalisation
5JKL 2ABC 8TUV 2ABC 4GHI	Can both enable an isable personalisation

Disabling Procedure

1 ☞ 7PQRS 4GHI 6MNO or 5JKL 2ABC 8TUV 2ABC 4GHI

2 ☞ to point at
SIM or SIM ersonalisation
et ork or et ork ersonalisation
Subnet ork or Subnet ork ersonalisation
S or Service rovi er ersonaisation or
Corporate or Co pany ersonalisation



450-0726

3 ☞

4 ☞ the 16 igit Control Key

5 ☞

6 ☞ the 16 igit Control Key

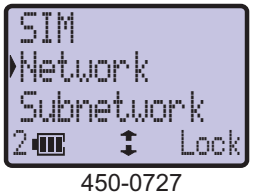
7 ☞

The isplay ill con ir hich type o ersonalisation has been isable

Enabling Procedure

1 5JKL 2ABC 8TUV 2ABC 4GHI

2 ☞ to point at
SIM or SIM ersonalisation
et ork or et ork ersonalisation
Subnet ork or Subnet ork ersonalisation
S or Service rovi er ersonaisation or
Corporate or Co pany ersonalisation



450-0727

3 ☞

4 ☞ the 16 igit Control Key

5 ☞

6 ☞ the 16 igit Control Key

7 ☞

The isplay ill con ir hich type o ersonalisation has been isable

8 CIRCUIT DIAGRAMS

8.1 Handheld Unit

8.1.1 Logic

The logic circuit iagra is split over 3 sheets The ain etails o each sheet is sho n

Figure 1: Logic ap 450-0801

The ave or s sho n belo relate to the logic circuit iagra on the ollo ing pages The ave or s sho n are or re erence purposes

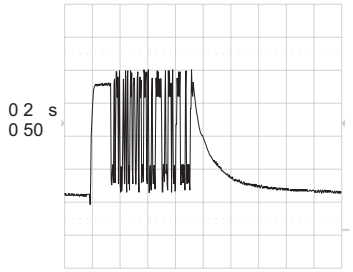


Figure 2: 1 450-0802

8.1.2 RF

The logic circuit iagra is split over 3 sheets The ain etails o each sheet is sho n

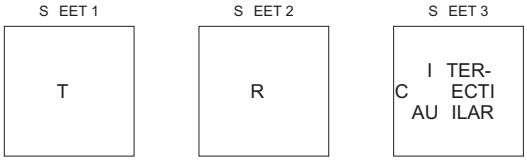


Figure 3: R Map 450-0803

The ave or s sho n belo relate to the logic circuit iagra on the ollo ing pages The ave or s sho n are or re erence purposes

Figure 4: 2 450-0804

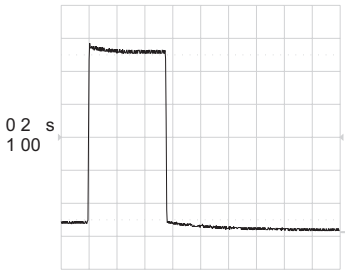


Figure 5: 3 450-0805

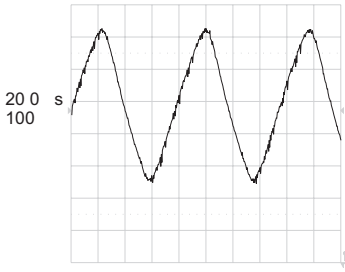


Figure 6: 4 450-0806

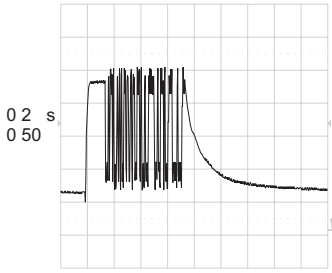
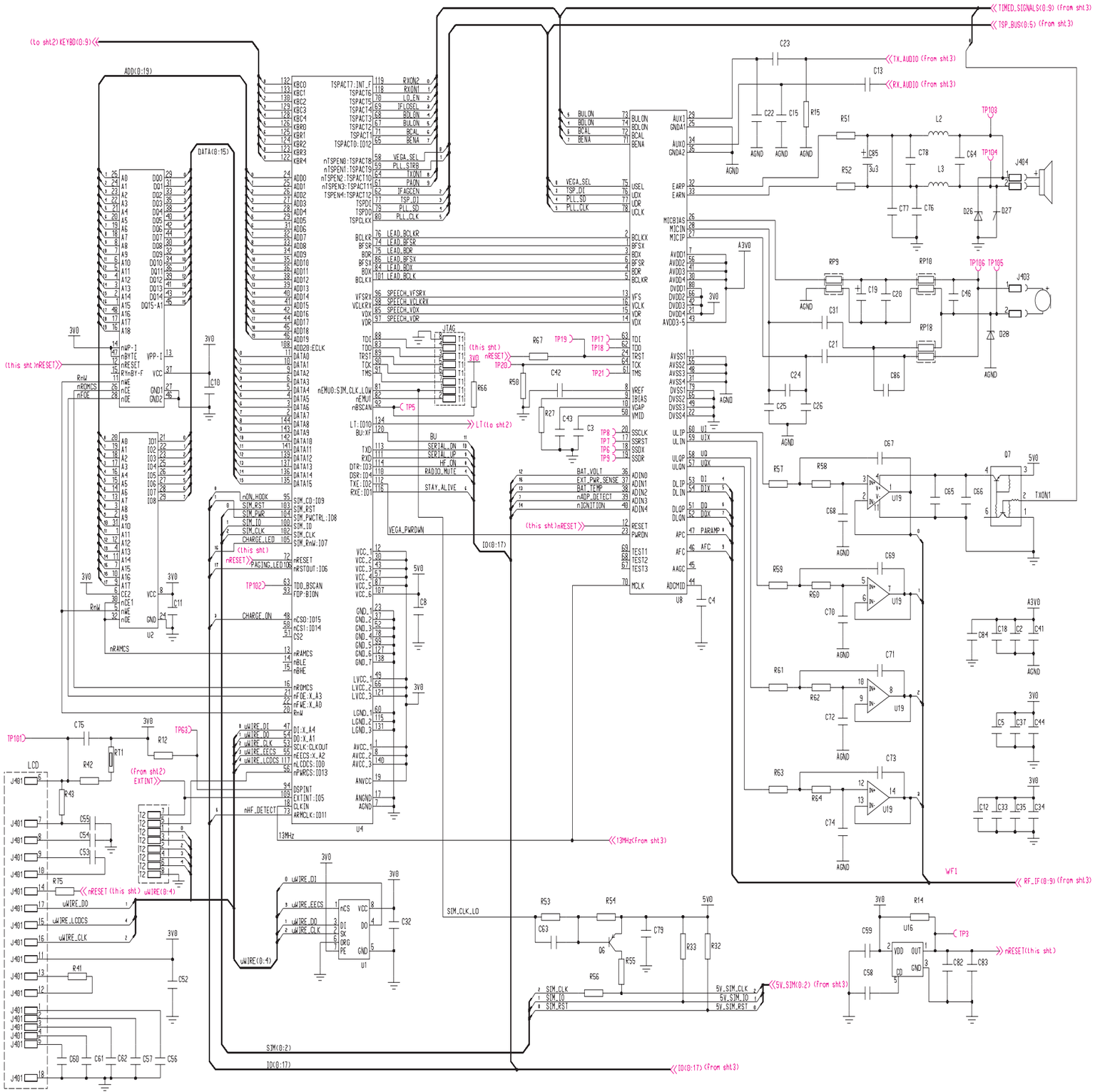
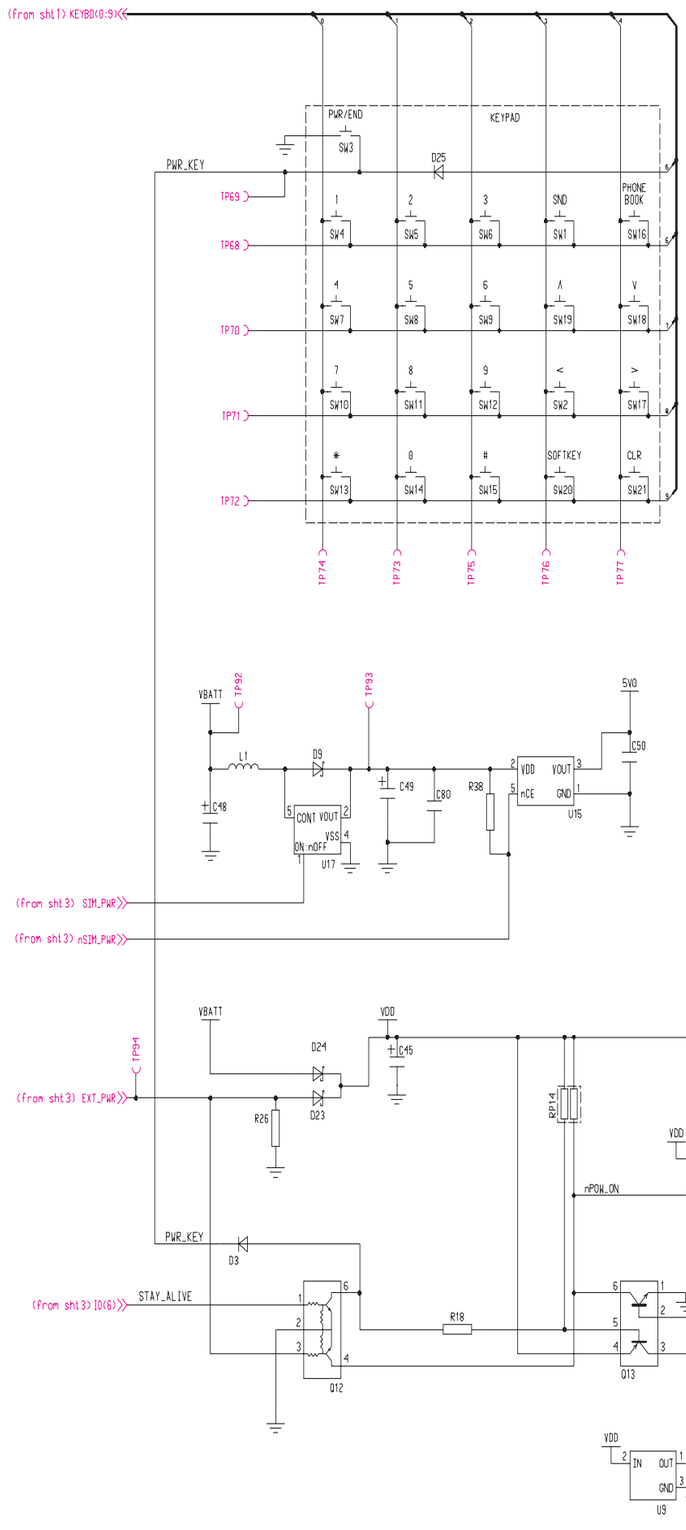


Figure 7: 5 450-0807

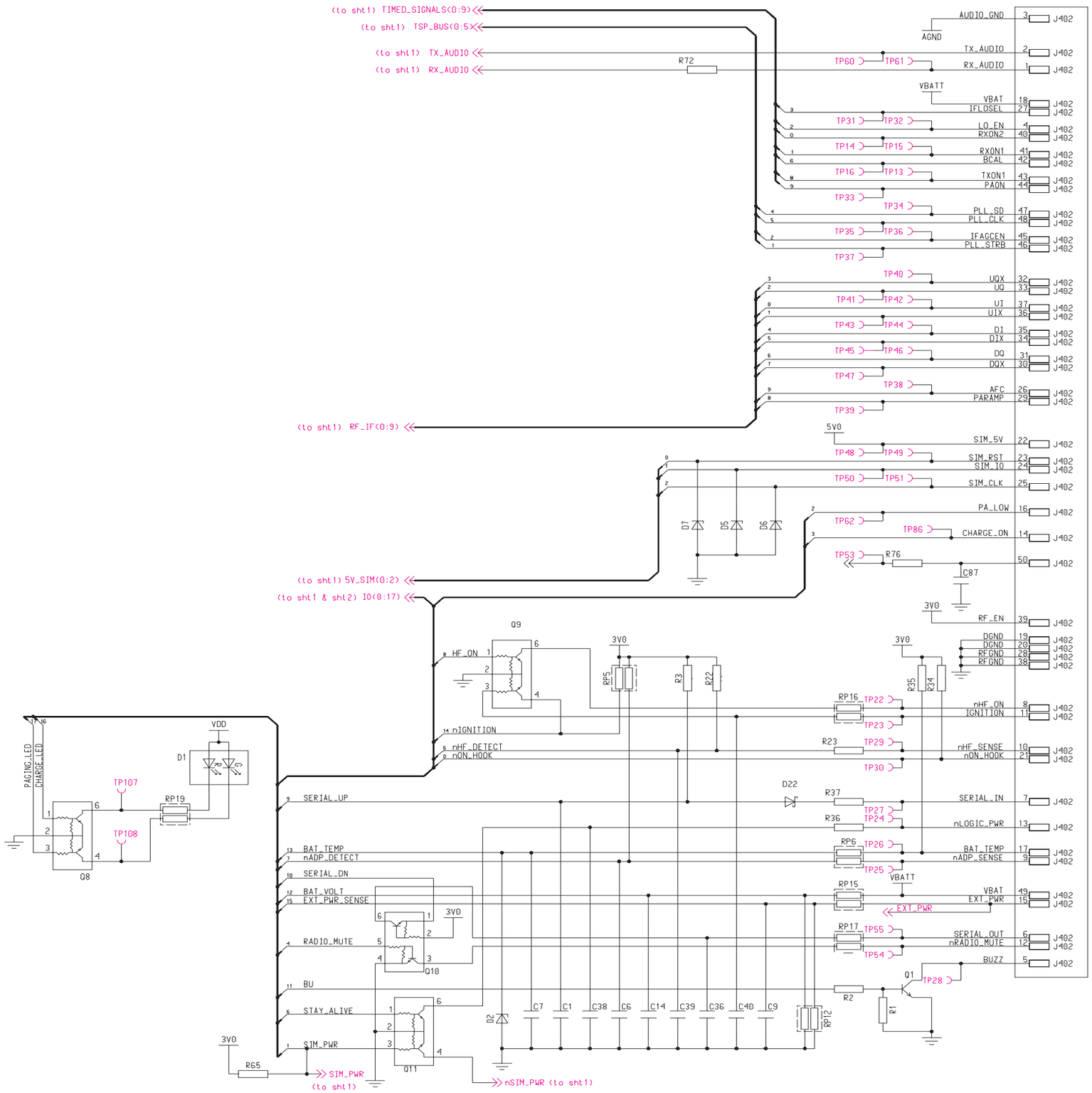
Logic Sheet 1



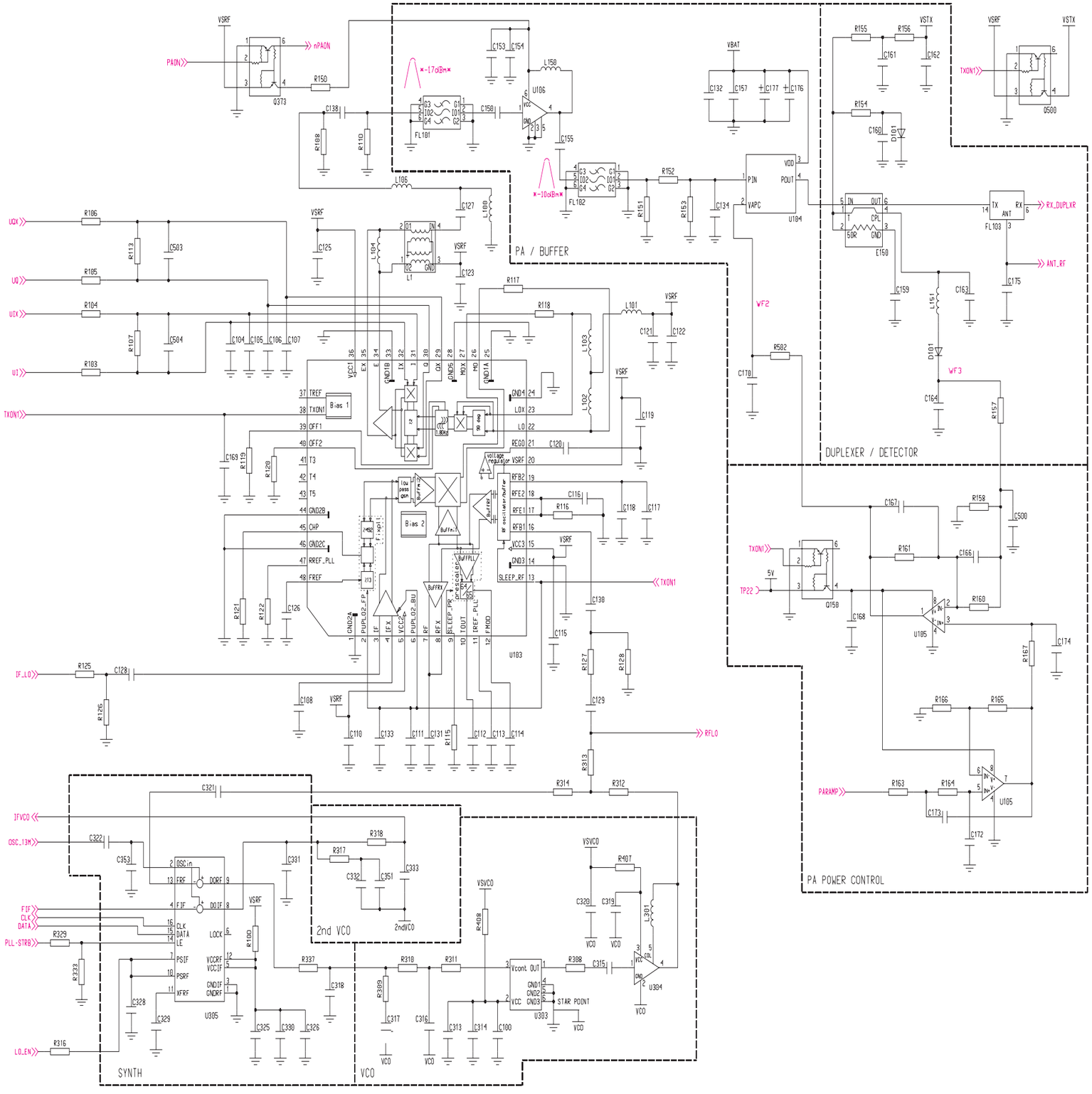
Logic Sheet 2



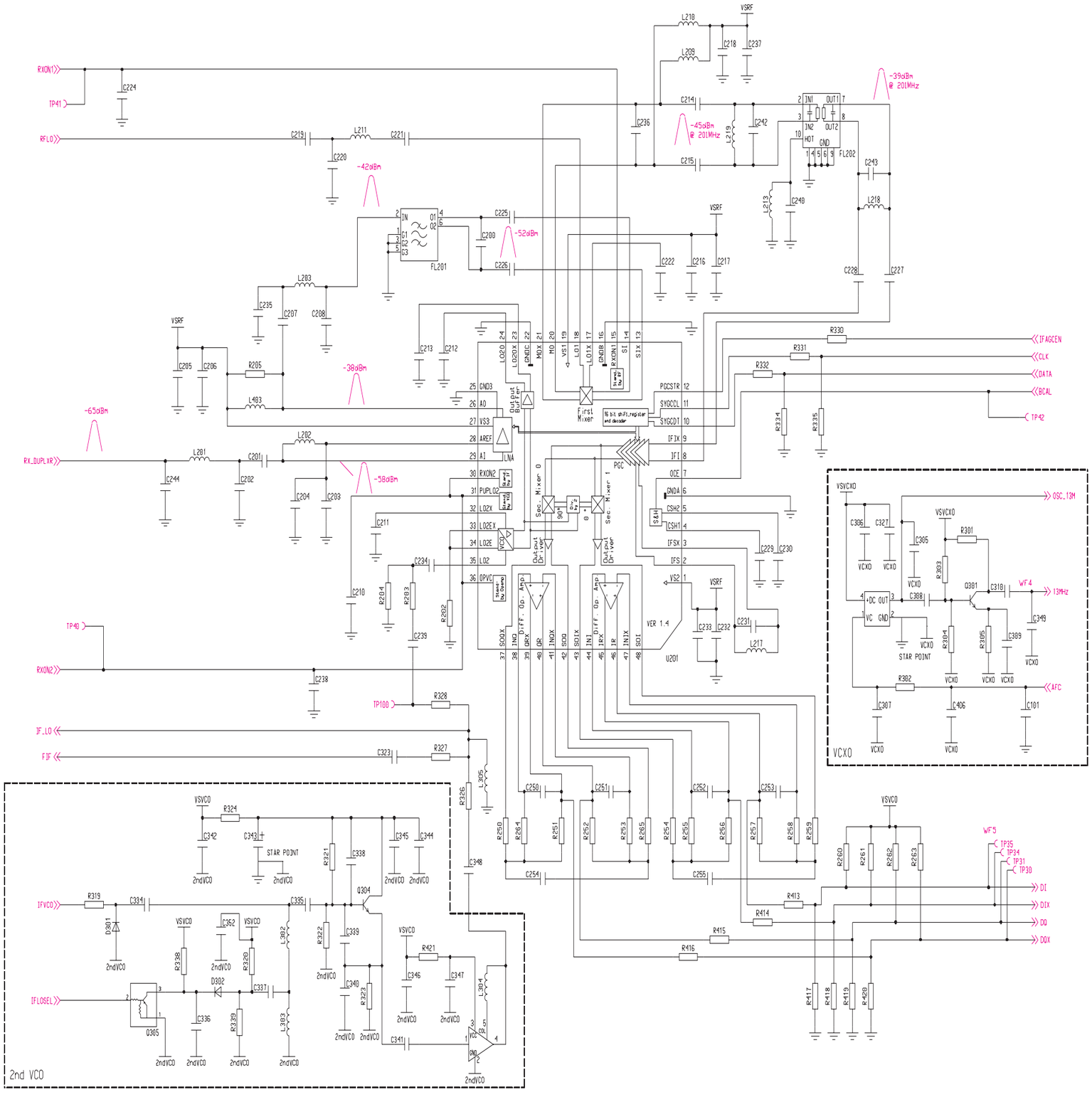
Logic Sheet 3



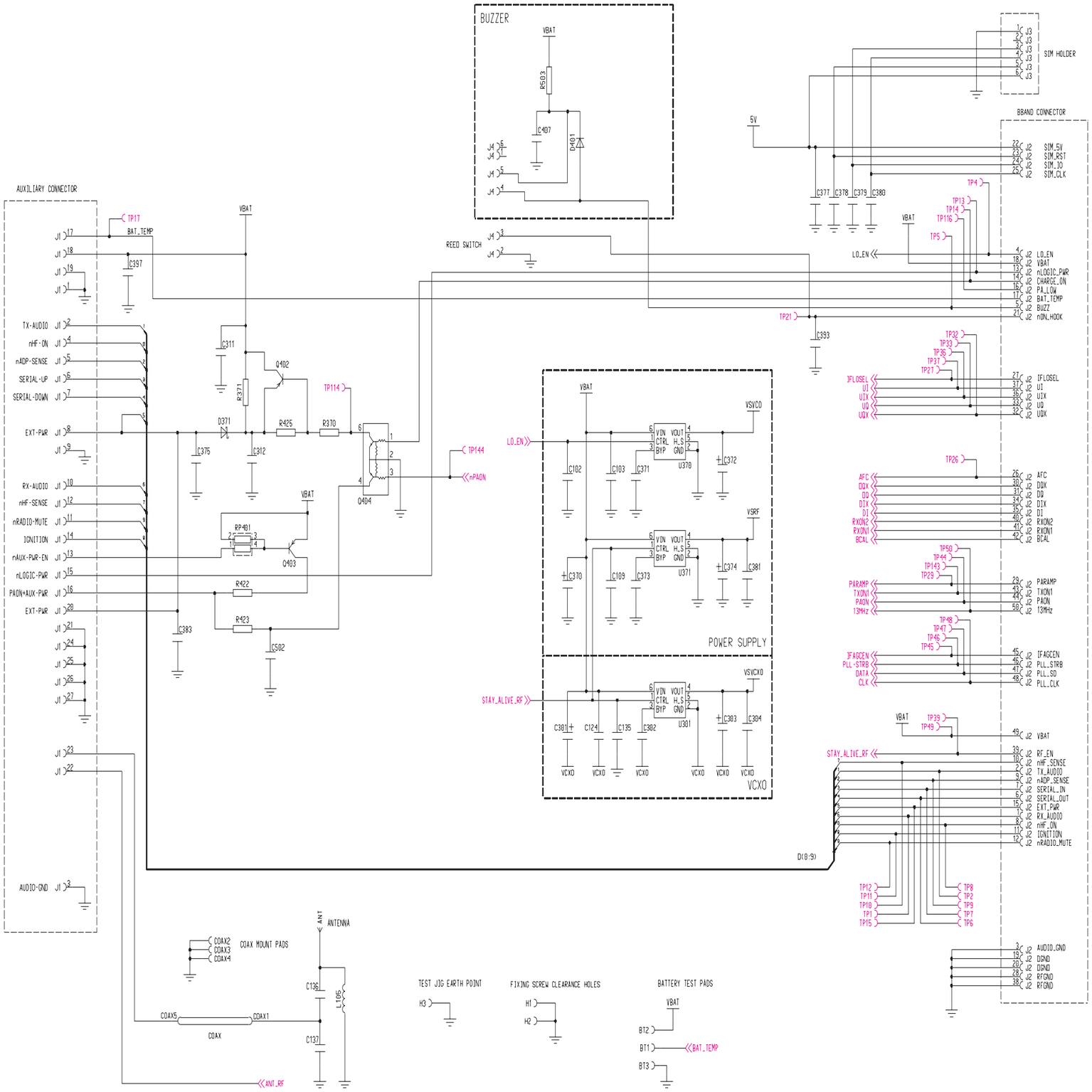
RF Sheet 1


PA / BUFFER
DUPLEXER / DETECTOR
PA POWER CONTROL
SYNTH
VCO
2nd VCO
VSRF
VBAT
VSTX
nPAON
PAON
TXON1
RX_DUPLXR
ANT_RF
WF2
WF3
RFLO
IF_LO
IFVCO
OSC_13M
PARAMP
PLL-STRB
LD_EN
STAR POINT
U104
U106
U183
U303
U304
U305
U105
FL101
FL102
FL103
Q373
Q500
Q158
D101
E150
L1
Bias 1
Bias 2
2nd VCO
VCO

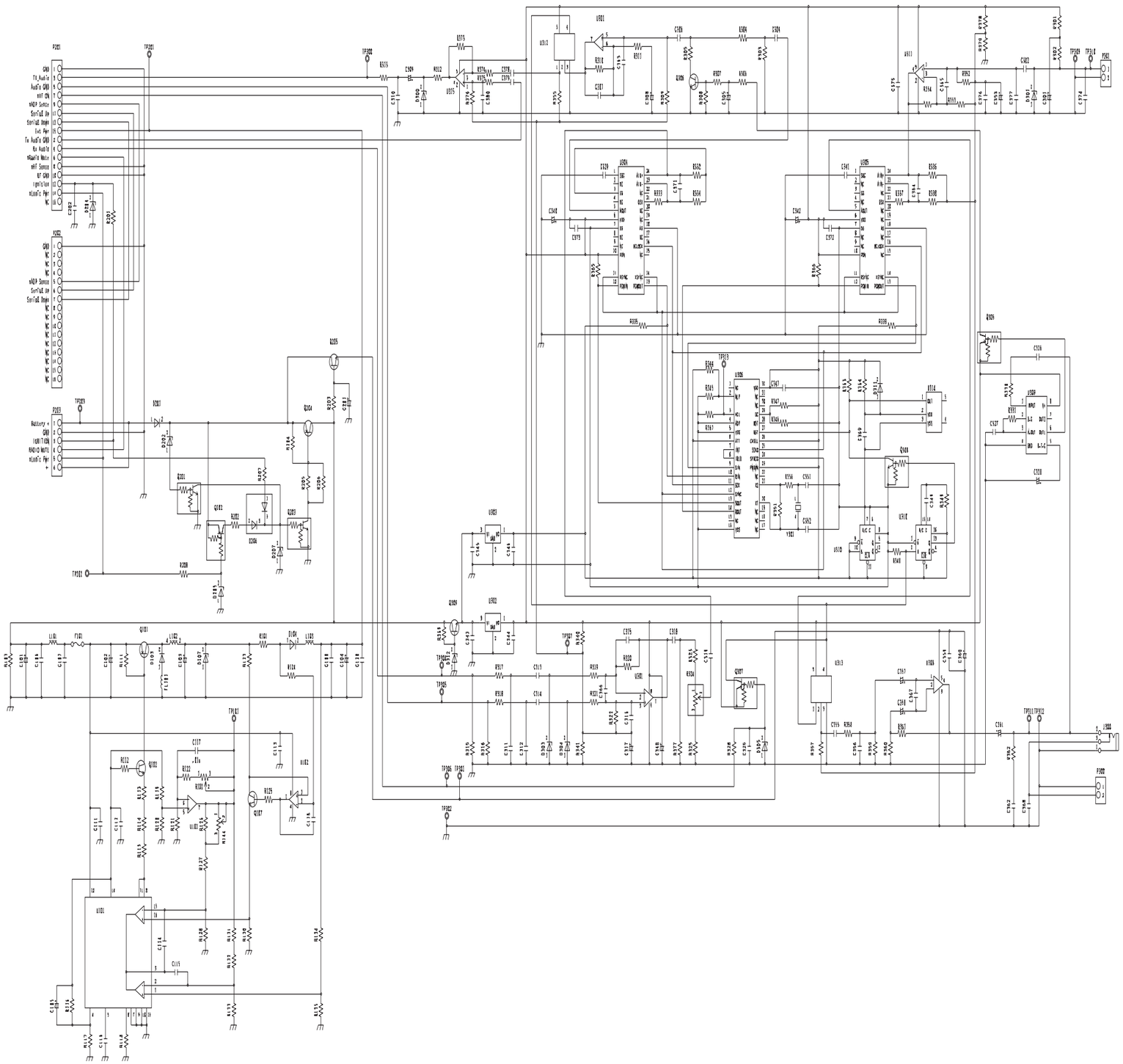
RF Sheet 2


RXON1
TP41
RFLO
RX_DUPLXR
TP40
RXON2
TP100
IF_LO
FIF
IFVCO
IFLOSEL
VSRF
VSVCO
VSVCO
VCXO
2nd VCO
STAR POINT
-65dBm
-58dBm
-38dBm
-42dBm
-52dBm
-45dBm @ 201MHz
-39dBm @ 201MHz
FL201
FL202
VER 1.4
U201
IFAGCEN
CLK
DATA
BCAL
TP42
DI
DIX
DQ
DQX
AFC
OSC_13M
13MHz
WF4
WF5
TP35
TP34
TP31
TP30

RF Sheet 3


BUZZER
VBAT
R503
C497
D401
REED SWITCH
AUXILIARY CONNECTOR
TP17
BAT_TEMP
C397
TX-AUDIO
nHF-ON
nADP-SENSE
SERIAL-UP
SERIAL-DOWN
EXT-PWR
RX-AUDIO
nHF-SENSE
nRADIO-MUTE
IGNITION
nAUX-PWR-EN
nLOGIC-PWR
PAON+AUX-PWR
EXT-PWR
AUDIO-GND
C311
Q402
R371
D371
R425
R370
TP114
C375
C312
Q404
TP144
nPAON
RP401
Q403
R422
R423
C383
C502
ANTENNA
COAX2
COAX3
COAX4
COAX MOUNT PADS
C136
L105
COAX5
COAX1
COAX
C137
ANT_RF
TEST JIG EARTH POINT
H3
FIXING SCREW CLEARANCE HOLES
H1
H2
BATTERY TEST PADS
BT2
BT1
BT3
BAT_TEMP
POWER SUPPLY
LO_EN
VIN
CTRL
BYP
VOUT
H_S
GND
U378
U371
VSVCO
VSRF
C102
C103
C371
C372
C370
C109
C373
C374
C381
VCXO
STAY_ALIVE_RF
U381
VSVCXO
C301
C124
C135
C382
C383
C384
SIM HOLDER
SIM_5V
SIM_RST
SIM_IO
SIM_CLK
BBAND CONNECTOR
C377
C378
C379
C380
5V
TP4
TP13
TP14
TP116
TP5
LO_EN
VBAT
nLOGIC_PWR
CHARGE_ON
PA_LOW
BAT_TEMP
BUZZ
nON_HOOK
TP21
C393
TP32
TP33
TP35
TP37
TP27
IFLOSEL
UI
UIX
UQ
UQX
TP26
AFC
DQX
DQ
DIX
DI
RXON2
RXON1
BCAL
TP50
TP44
TP143
TP29
PARAMP
TXON1
PAON
13MHz
TP48
TP47
TP46
TP45
IFAGCEN
PLL_STRB
DATA
CLK
TP39
TP49
RF_EN
nHF_SENSE
TX_AUDIO
nADP_SENSE
SERIAL_IN
SERIAL_OUT
EXT_PWR
RX_AUDIO
nHF_ON
IGNITION
nRADIO_MUTE
D(0:9)
TP12
TP11
TP10
TP1
TP15
TP8
TP2
TP3
TP7
TP6
AUDIO_GND
DGND
DGND
RFGND
RFGND

8.2 Handsfree Unit



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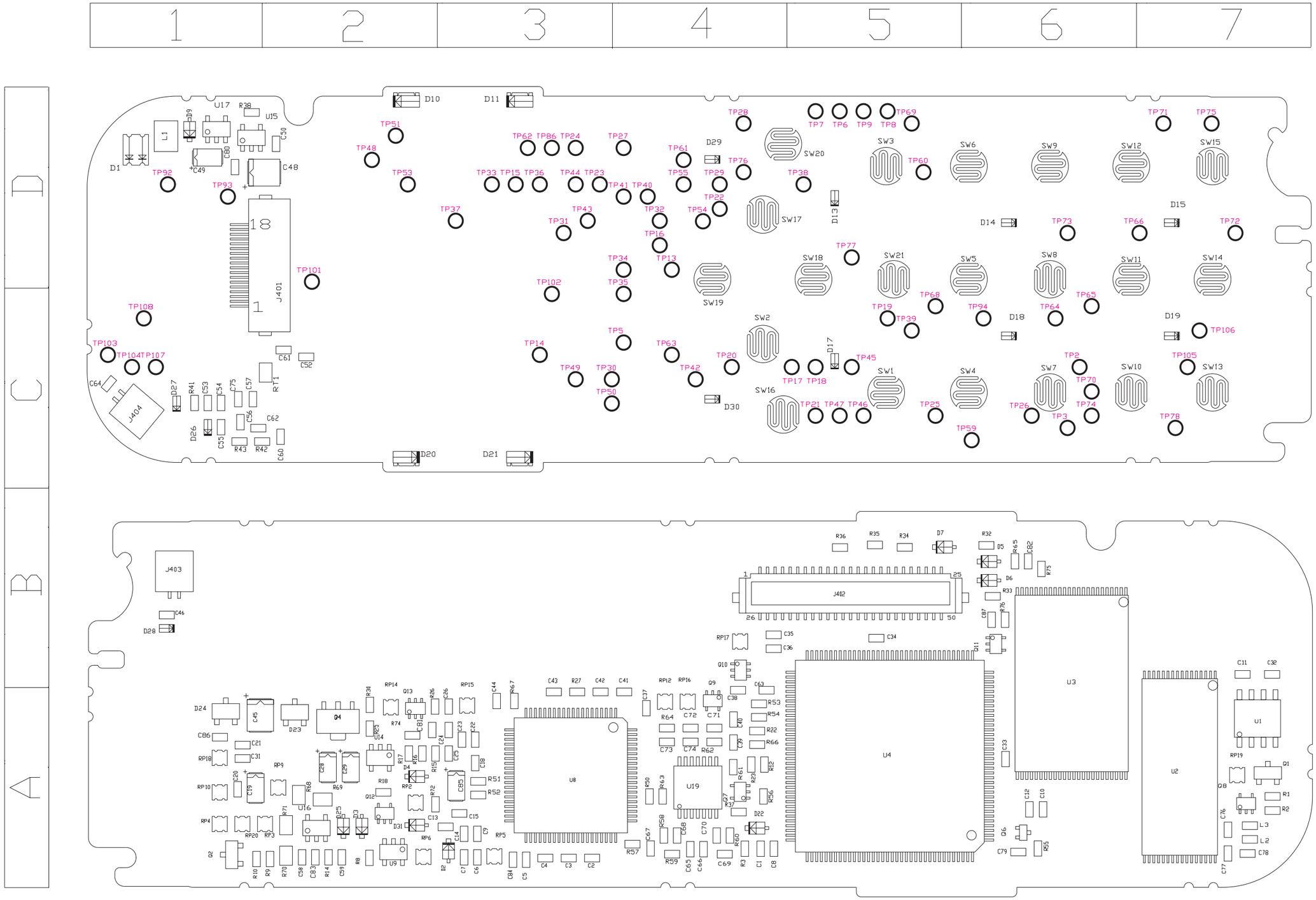
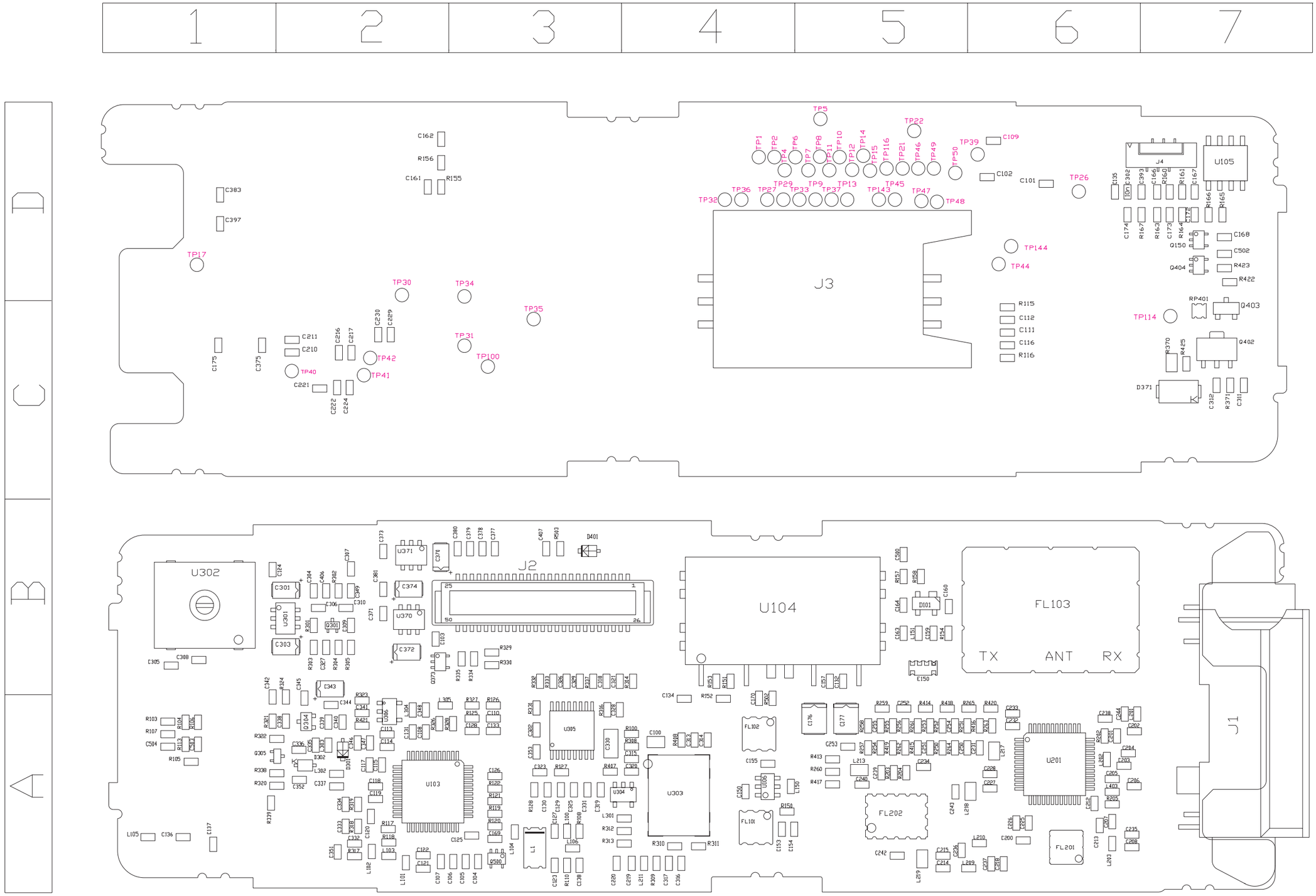
9 PCB LAYOUT DIAGRAMS

9.1 Handheld Unit

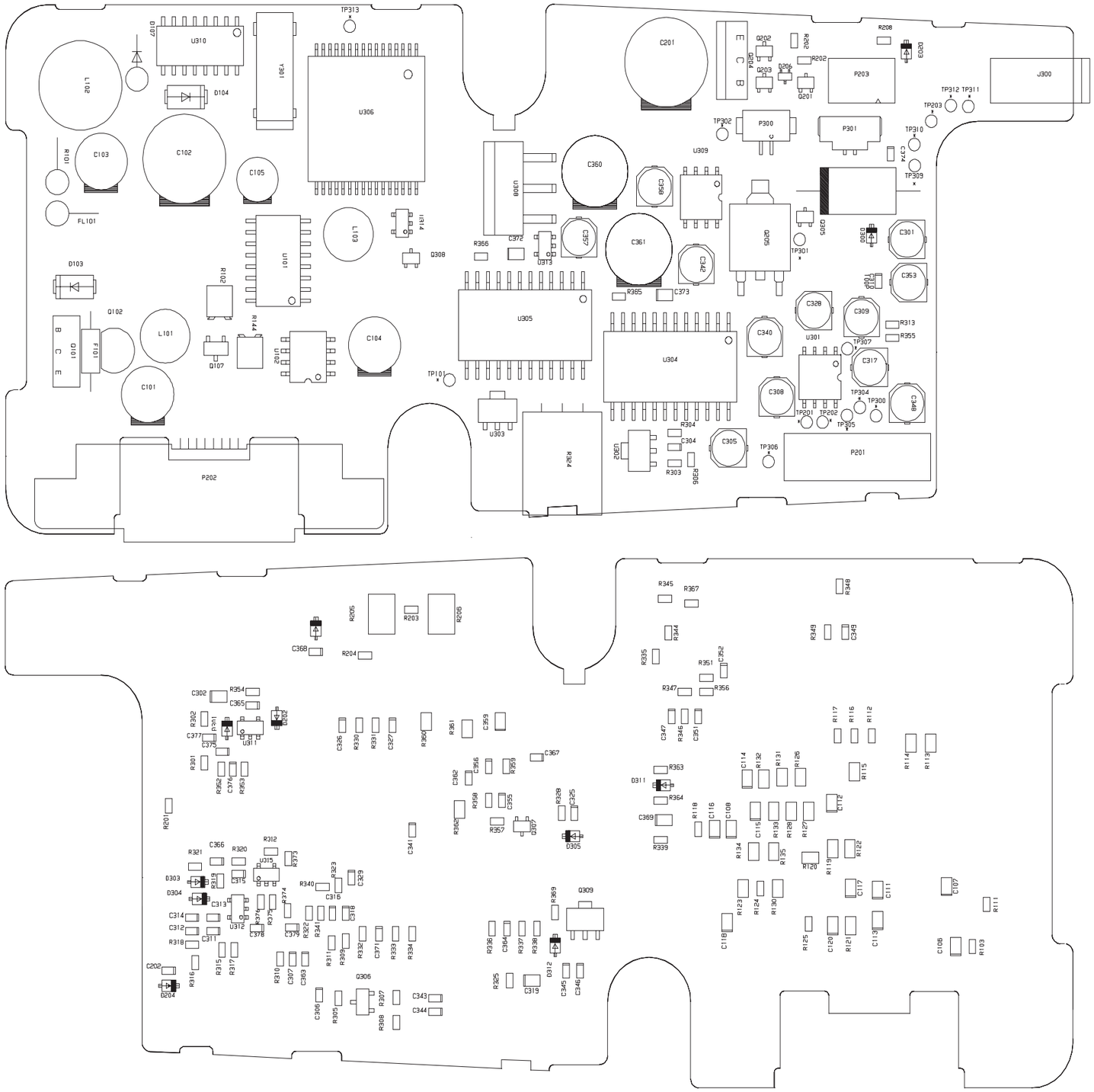
9.1.1 Logic



9.1.2 RF


1
2
3
4
5
6
7
D
C
B
A
TP5
TP22
TP1
TP2
TP6
TP8
TP10
TP14
TP4
TP7
TP11
TP12
TP15
TP116
TP21
TP46
TP49
TP39
C109
TP50
C102
C101
TP26
TP29
TP9
TP13
TP45
TP36
TP27
TP33
TP37
TP143
TP47
TP32
TP48
TP144
TP44
J3
C162
R156
C161
R155
C383
C397
TP17
TP30
TP34
TP35
TP31
TP100
TP42
TP41
TP40
C211
C210
C221
C216
C217
C230
C229
C175
C375
C222
C224
R115
C112
C111
C116
R116
J4
U105
C135
10n
C302
C393
C166
R160
R161
C167
R166
R165
C174
R167
R163
C173
R164
C172
C168
Q150
C502
Q404
R423
R422
RP401
Q403
TP114
R370
R425
Q402
D371
C312
R371
C311
C305
C388
U302
C124
C301
U301
C303
C344
C406
R382
C349
C306
C310
R301
Q301
R302
R303
C327
R304
R305
C307
C371
C373
U371
C376
C374
U370
C372
C380
C379
C378
C377
C407
R503
D401
J2
25
1
50
26
C103
Q373
R329
R330
R335
R334
U104
C590
R157
R158
D101
C160
C163
L151
C159
R154
E150
FL103
TX
ANT
RX
C342
R324
C345
C343
C344
R323
C341
R421
U306
C304
C348
C339
C340
C131
C108
R336
R337
R338
R339
R340
R341
R342
R343
R344
R345
R346
R347
R348
R349
R350
R351
R352
R153
R151
C134
C170
C590
C157
C132
R103
R104
R106
R107
C504
R113
C502
R105
R321
C338
R322
C335
C336
C383
C346
C347
C114
Q305
R338
R320
B302
C302
C352
C337
D301
C117
C115
C118
C119
C334
R318
C333
R308
C332
R317
C351
L102
C120
U103
C126
R122
R121
R119
R120
C169
C125
G500
L104
L105
C136
C137
L101
C122
C121
C107
C106
C105
C104
L1
C123
R110
C138
U305
C330
C332
C323
R127
R128
C130
C129
C325
C331
C319
R100
R308
C315
C329
R447
U304
L301
R312
R313
C100
U303
R310
R311
C155
FL102
C150
U106
L150
R150
FL101
C153
C154
C176
C177
R259
C252
R414
R418
R265
R420
C233
C253
R257
R254
R415
R262
R255
R256
R263
R264
R260
R417
R413
C240
L213
C239
C241
C234
C229
C227
C243
L218
U201
C238
C244
C230
C202
C204
C236
C203
C205
C403
C206
C232
R205
C226
C225
C200
L210
C242
L219
C215
C226
C214
L209
C227
C228
FL202
FL201
C213
C235
C208
L203
J1

9.2 Handsfree Unit



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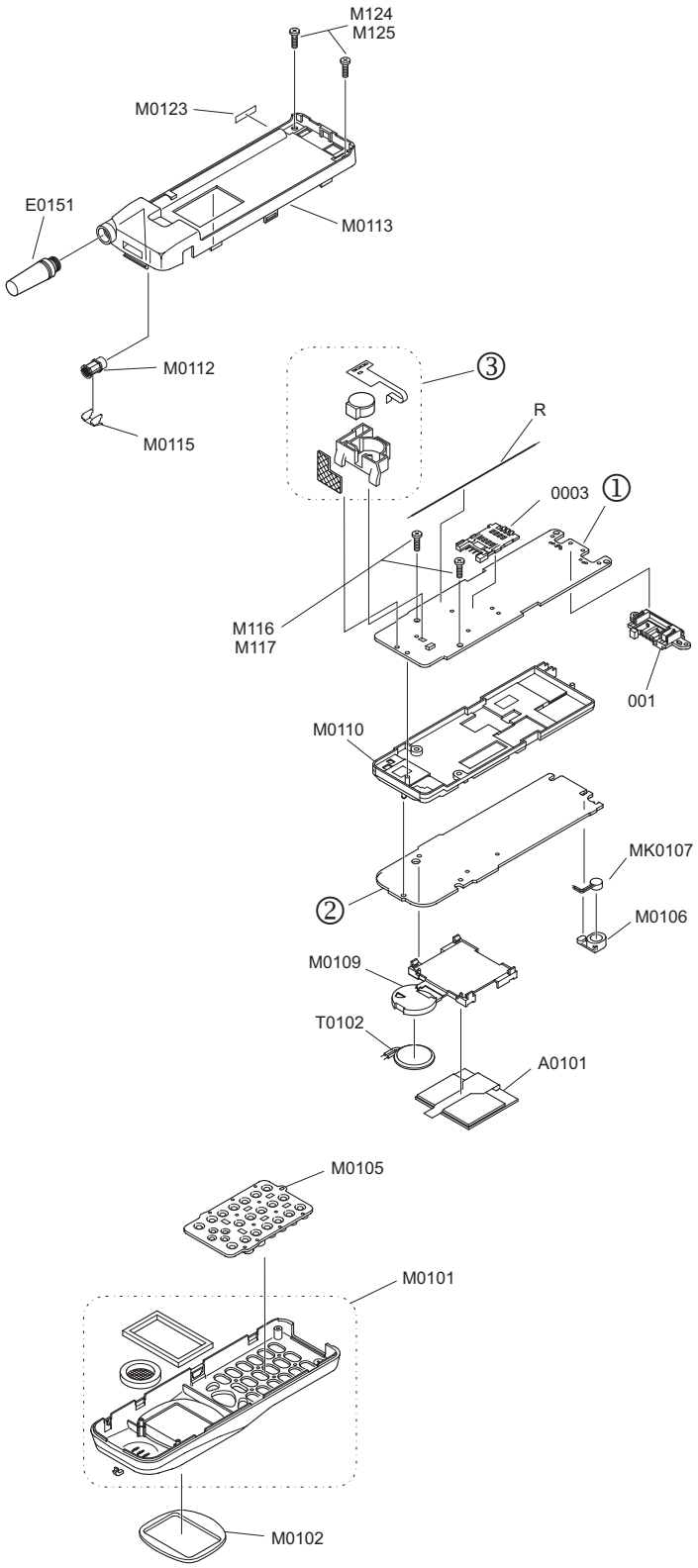
10 PARTS LIST

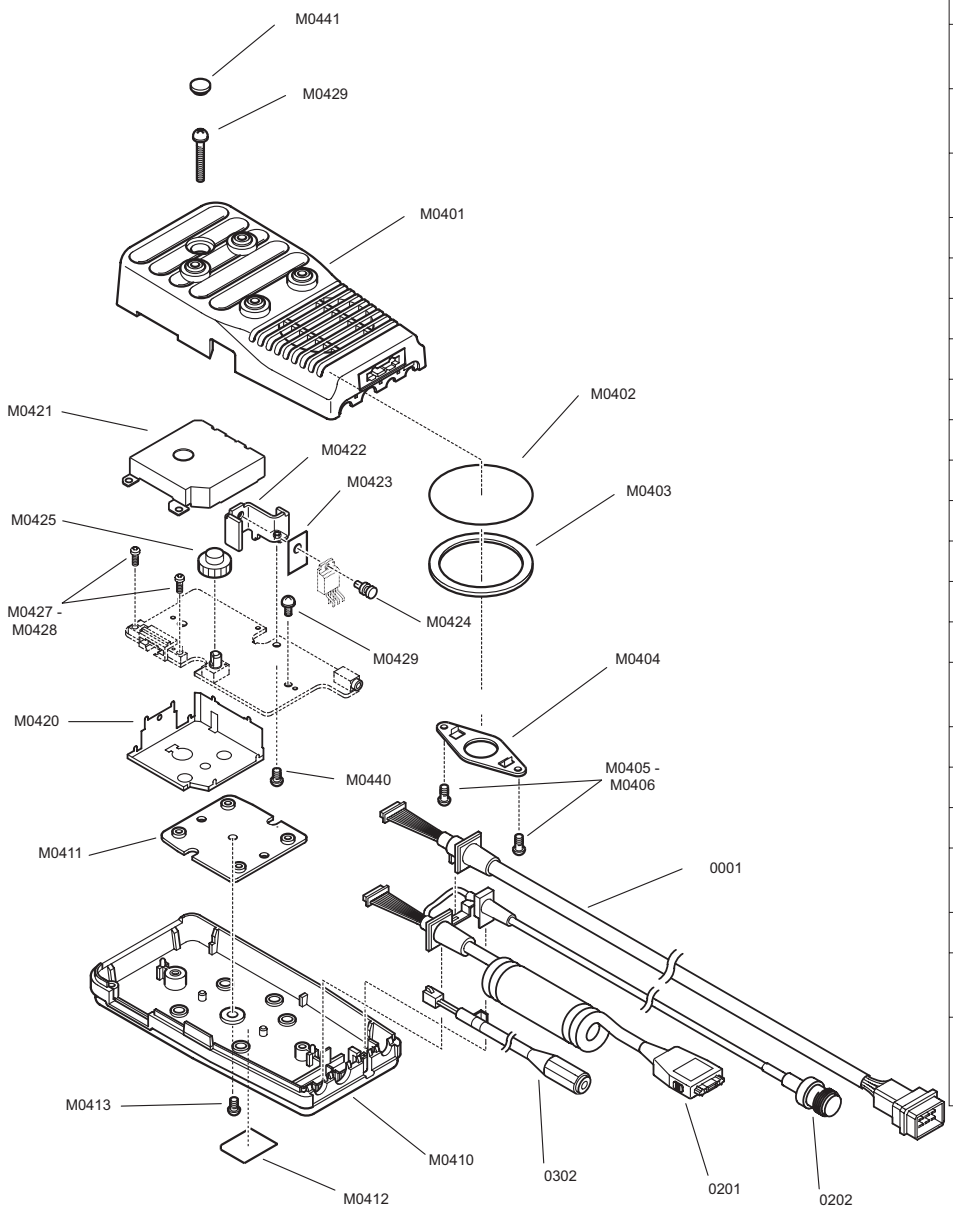
10.1 Handheld Unit



Ref.	Parts No	Name
1	G4570631A	Asse ble R C
2	G4570630A	Asse ble Logic C
3	AS70011A	u er ol er Assy
A0101	AA70050A	LC Mo ule
E0151	A 70073A	i e Antenna
T0102	S70016A	Receiver
0003	S70004A	SIM ol er
001	A70024C	I Connector
M0101	G450C AS01K G450C AS01M	Cover Assy lack Cover Assy Metalic lue
M0102	5 70086 A	LC anel
M0105	5 70115AA	Key Sheet
M0106	5 70018A	Microphone ushing
M0109	5S70074A	LC acklight
M0110	5 70058	Chassis
M0112	4G70003A	Antenna ol er
M0113	5M70149A	Case
M0115	1 70188A	Antenna Ter inal
M0123	G5M S002	atent Label
M116 M117	3 70027A	Scre
M124 M125	3 70027A	Scre
MK0107	M70011A	Microphone Assy
R	70057	Co-a Cable

Figure 1: an hel Unit 450-1001

10.2 Handsfree Unit



Ref.	Parts No	Name
M0401	5 70086A	Cover
M0402	6 10031A	Speaker net
M0403	4R8209	Speaker packing
M0404	1 70071A	Speaker bracket
M0405 M0406	T 256G	Scre 2
M0410	5M70076A	Case
M0411	1 C5819A	late
M0412	7 70119A	a e plate
M0413	S 35	Scre
M0420	1C70128A	Sheil Case 1
M0421	1C70129A	Sheil Case 2
M0422	1E70008A	Ra iator
M0423	5G10500A	Insulator
M0424	1M270900102	Cla p
M0425	5 5129A	olu e knob
M0426	3 6	Scre
M0427 M0428	T 2510G	Scre 2
M0429	T 256G	Scre
M0440	3 30	Scre
M0441	5U70008	Top cushion
0001	70005A	o er Supply Cable
0201	C70109A	Curly Cor
0202	C70110A	Interconnecting Cable
0302	G70003A	E ternal Microphone Cable

Figure 2: an s ree Unit 500-1002

10.3 Handheld Replacement Parts List

10.3.1 Logic

MODEL	E -G450	NAME			Logic	
Ref.	**Part No.**	**Description**			**Grid**	**Remarks**
	G4570630A	ASSEM LE L GIC C				
C001	GM1C102 1ET	CA ACIT R	1n	25	A4	
C002	ECU 1C104K	CA ACIT R	100n	16	A3	
C003	ECU 1C104K	CA ACIT R	100n	16	A3	
C004	ECU 1C104K	CA ACIT R	100n	16	A3	
C005	ECU 1C104K	CA ACIT R	100n	16	A3	
C006	ECU 1C104K	CA ACIT R	100n	16	A3	
C007	ECU 1C104K	CA ACIT R	100n	16	A3	
C008	ECU 1C104K	CA ACIT R	100n	16	A4	
C009	GM1 105 1AT	CA ACIT R	1µ	10	A3	
C010	ECU 1C104K	CA ACIT R	100n	16	A3	
C011	ECU 1C104K	CA ACIT R	100n	16	7	
C012	ECU 1C104K	CA ACIT R	100n	16	A6	
C013	GM1 105 1AT	CA ACIT R	1µ	10	A3	
C014	GM1 105 1AT	CA ACIT R	1µ	10	A3	
C015	GM1C101 1 T	CA ACIT R	100p	50	A3	
C017	GM1C101 1 T	CA ACIT R	100p	50	A3	
C018	ECU 1C104K	CA ACIT R	100n	16	A3	
C019	CS U011M156	CA ACIT R	15µ	6	A1	
C020	ECU 1C104K	CA ACIT R	100n	16	A1	
C021	ECU 1C104K	CA ACIT R	100n	16	A1	
C022	GM1C101 1 T	CA ACIT R	100p	50	A3	
C023	GM1 105 1AT	CA ACIT R	1µ	10	A3	
C024	GM1C101 1 T	CA ACIT R	100p	50	A3	
C025	GM1C101 1 T	CA ACIT R	100p	50	A3	
C026	GM1C101 1 T	CA ACIT R	100p	50	A3	
C028	CS U011M156	CA ACIT R	15µ	6	A2	
C029	CS U011M156	CA ACIT R	15µ	6	A2	
C031	ECU 1C104K	CA ACIT R	100n	16	A1	
C032	ECU 1C104K	CA ACIT R	100n	16	7	
C033	ECU 1C104K	CA ACIT R	100n	16	A6	
C034	ECU 1C104K	CA ACIT R	100n	16	5	
C035	ECU 1C104K	CA ACIT R	100n	16	4	
C036	GM1C102 1ET	CA ACIT R	1n	25	4	
C037	ECU 1C104K	CA ACIT R	100n	16	A4	
C038	ECU 1C104K	CA ACIT R	100n	16	A4	
C039	ECU 1C104K	CA ACIT R	100n	16	A4	
C040	ECU 1C104K	CA ACIT R	100n	16	A4	
C041	ECU 1C104K	CA ACIT R	100n	16	A4	
C042	ECU 1C104K	CA ACIT R	100n	16	A3	
C043	ECU 1C104K	CA ACIT R	100n	16	A3	
C044	ECU 1C104K	CA ACIT R	100n	16	A3	
C045	CS U013M156	CA ACIT R	15µ	16	A1	
C046	GM1C101 1 T	CA ACIT R	100p	50	1	
C048	CS U013M156	CA ACIT R	15µ	16	1	
C049	CS U015M106	CA ACIT R	10µ	10	1	
C050	GM1 105 1AT	CA ACIT R	1µ	10	2	
C052	GM1 105 1AT	CA ACIT R	1µ	10	C2	
C053	GM1 105 1AT	CA ACIT R	1µ	10	C1	
C054	GM1 105 1AT	CA ACIT R	1µ	10	C1	
C055	GM1 105 1AT	CA ACIT R	1µ	10	C1	
C056	ECU 1C104K	CA ACIT R	100n	16	C1	
C057	ECU 1C104K	CA ACIT R	100n	16	C1	
C058	ECU 1C104K	CA ACIT R	100n	16	A2	

MODEL	E -G450	NAME			Logic	
Ref.	Part No.	Description			Grid	Remarks
C059	ECU 1C104K	CA ACIT R	100n	16	A2	
C060	ECU 1C104K	CA ACIT R	100n	16	C2	
C061	ECU 1C104K	CA ACIT R	100n	16	C2	
C062	ECU 1C104K	CA ACIT R	100n	16	C1	
C063	ECU 1 470 C	CA ACIT R	47p	50	A4	
C064	GM1C101 1 T	CA ACIT R	100p	50	C1	
C065	ECU 1C104K	CA ACIT R	100n	16	A4	
C066	GM1C101 1 T	CA ACIT R	100p	50	A4	
C067	ECU 1 821 C	CA ACIT R	820p	50	A4	
C068	ECU 1 391 C	CA ACIT R	390p	50	A4	
C069	ECU 1 821 C	CA ACIT R	820p	50	A4	
C070	ECU 1 391 C	CA ACIT R	390p	50	A4	
C071	ECU 1 821 C	CA ACIT R	820p	50	A4	
C072	ECU 1 391 C	CA ACIT R	390p	50	A4	
C073	ECU 1 821 C	CA ACIT R	820p	50	A4	
C074	ECU 1 391 C	CA ACIT R	390p	50	A4	
C075	GM1 105 1AT	CA ACIT R	1µ	10	C1	
C076	GM1C101 1 T	CA ACIT R	100p	50	A7	
C077	GM1C101 1 T	CA ACIT R	100p	50	A7	
C078	GM1C101 1 T	CA ACIT R	100p	50	A7	
C079	ECU 1C104K	CA ACIT R	100n	16	A7	
C080	GM1C101 1 T	CA ACIT R	100p	50	1	
C081	GM1 105 1AT	CA ACIT R	1µ	10	A2	
C082	GM1 105 1AT	CA ACIT R	1µ	10	6	
C083	GM1 105 1AT	CA ACIT R	1µ	10	A2	
C084	ECU 1 470 C	CA ACIT R	47p	50	A3	
C085	CS U009M335	CA ACIT R	3 3µ	16	A3	
C086	ECU 1E223K	CA ACIT R	22n	25	A1	

MODEL	E -G450	NAME	Logic	
Ref.	Part No.	Description	Grid	Remarks
001	CL155URG T	LE 2 C L UR	1	
002	MA8062MT	E ER I E	A3	
003	MA111T	I E	A2	
004	MA111T	I E	A2	
005	MA8062MT	E ER I E	6	
006	MA8062MT	E ER I E	6	
007	MA8062MT	E ER I E	5	
009	MA729T	I E	1	
010	L1650 G	LE GREE	2	
011	L1650 G	LE GREE	3	
013	1111C650TR	LE ELL	5	
014	1111C650TR	LE ELL	6	
015	1111C650TR	LE ELL	7	
017	1111C650TR	LE ELL	C5	
018	1111C650TR	LE ELL	C6	
019	1111C650TR	LE ELL	C7	
020	L1650 G	LE GREE	C2	
021	L1650 G	LE GREE	C3	
022	MA729T	I E	A4	
023	R 411 T146	I E	A2	
024	R 411 T146	I E	A1	
025	MA111T	I E	A2	
026	MA S0470GL	E ER I E	C1	
027	MA S0470GL	E ER I E	C1	
028	MA S0470GL	E ER I E	1	
029	1111C650TR	LE ELL	4	
030	1111C650TR	LE ELL	C4	
031	MA111T	I E	A2	

MODEL	E -G450	NAME		Logic	
Ref.	Part No.	Description		Grid	Remarks
T0102	S70016A	RECEI ER			
401	528931890	C ECT R	18 A	1	
402	A 00118	C ECT R	50 A	5	
403	SM02 SRSS	2 A S CKET		1	
404	SM02 SRSS	2 A S CKET		C1	
L001	L 3C101KT	I UCT R	100µ	1	
L002	LL1608 82	I UCT R	82n	A7	
L003	LL1608 82	I UCT R	82n	A7	
001	C 65CTA	TRA SIST R		A7	
002	C 65CTA	TRA SIST R		A1	
004	2S 1424T100R	TRA SIST R		A2	
006	2SA1774TLR	TRA SIST R		A6	
007	UMC2TR	TRA SIST R		A4	
008	UMG8TR	TRA SIST R		A7	
009	UMG2TR	TRA SIST R		A4	
010	UM 10T	TRA SIST R		4	
011	UMG2TR	TRA SIST R		6	
012	UMG2TR	TRA SIST R		A2	
013	UM 1 TR	TRA SIST R		A2	
R001	ER 3GE 104	RESIST R	100kΩ	A7	
R002	ER 3GE 332	RESIST R	3k3Ω	A7	
R003	ER 3GE 103	RESIST R	10kΩ	A4	
R008	ER 3GE 104	RESIST R	100kΩ	A2	
R009	ER 3GE 332	RESIST R	3k3Ω	A2	
R010	ER 3GE 104	RESIST R	100kΩ	A1	

MODEL	E -G450	NAME		Logic	
Ref.	Part No.	Description		Grid	Remarks
R012	ER 3GE 104	RESIST R	100kΩ	A4	
R014	ER 3GE 103	RESIST R	10kΩ	A2	
R015	ER 3GE 103	RESIST R	10kΩ	A2	
R016	ER 3GE 223	RESIST R	22kΩ	A2	
R017	ER 3GE 104	RESIST R	100kΩ	A2	
R018	ER 3GE 563	RESIST R	56kΩ	A2	
R022	ER 3GE 104	RESIST R	100kΩ	A4	
R023	ER 3GE 331	RESIST R	330Ω	A4	
R025	ER 3GE 102	RESIST R	1kΩ	A2	
R026	ER 3GE 222	RESIST R	2k2Ω	A2	
R027	ER 3GE 104	RESIST R	100kΩ	A3	
R030	ER 3GE 103	RESIST R	10kΩ	A2	
R032	ER 3GE 103	RESIST R	10kΩ	6	
R033	ER 3GE 103	RESIST R	10kΩ	6	
R034	ER 3GE 103	RESIST R	10kΩ	5	
R035	ER 3GE 683	RESIST R	68kΩ	5	
R036	ER 3GE 331	RESIST R	330Ω	5	
R037	ER 3GE 331	RESIST R	330Ω	A4	
R038	ER 3GE 104	RESIST R	100kΩ	1	
R041	ER 3GE 184	RESIST R	180kΩ	C1	
R042	ER 3GE 563	RESIST R	56kΩ	C1	
R043	ER 3GE 222	RESIST R	2k2Ω	C1	
R050	ER 3GE 104	RESIST R	100kΩ	A4	
R051	ER 3GE 120	RESIST R	12Ω	A3	
R052	ER 3GE 120	RESIST R	12Ω	A3	
R053	ER 3GE 332	RESIST R	3k3Ω	A4	
R054	ER 3GE 331	RESIST R	330Ω	A4	
R055	ER 3GE 221	RESIST R	220Ω		

MODEL	E -G450	NAME	Logic	
Ref.	**Part No.**	**Description**	**Grid**	**Remarks**
R056	ER 3GE 470	RESIST R 47Ω	A4	
R057	ER 3GE 102	RESIST R 1kΩ	A4	
R058	ER 3GE 182	RESIST R 1k8Ω	A4	
R059	ER 3GE 102	RESIST R 1kΩ	A4	
R060	ER 3GE 182	RESIST R 1k8Ω	A4	
R061	ER 3GE 102	RESIST R 1kΩ	A4	
R062	ER 3GE 182	RESIST R 1k8Ω	A4	
R063	ER 3GE 102	RESIST R 1kΩ	A4	
R064	ER 3GE 182	RESIST R 1k8Ω	A4	
R066	ER 3GE 104	RESIST R 100kΩ	A4	
R067	ER 3GE 223	RESIST R 22kΩ	A3	
R068	ER 6GE 181	RESIST R 180Ω	A2	
R069	ER 6GE 181	RESIST R 180Ω	A2	
R070	ER 6GE 181	RESIST R 180Ω	A2	
R071	ER 6GE 181	RESIST R 180Ω	A2	
R072	ER 3GE 331	RESIST R 330Ω	A2	
R074	ER 3GE 104	RESIST R 100kΩ	A2	
R075	ER 3GE 102	RESIST R 1kΩ	6	
R076	ER 3GE 681	RESIST R 680Ω	6	
R 002	E 4 391	RESIST R 390Ω	A2	
R 003	E 4 391	RESIST R 390Ω	A2	
R 004	E 4 391	RESIST R 390Ω	A1	
R 005	E 4 104	RESIST R 100kΩ	A3	
R 006	E 4 331	RESIST R 330Ω	A2	
R 009	E 4 331	RESIST R 330Ω	A2	
R 010	E 4 122	RESIST R 1k2Ω	A1	
R 012	E 4 273	RESIST R 27kΩ	A4	

MODEL	E -G450	NAME	Logic	
Ref.	**Part No.**	**Description**	**Grid**	**Remarks**
R 014	E 4 563	RESIST R 56kΩ	A2	
R 015	E 4 104	RESIST R 100kΩ	A3	
R 016	E 4 331	RESIST R 330Ω	A4	
R 017	E 4 331	RESIST R 330Ω		
R 018	E 4 331	RESIST R 330Ω	A1	
R 019	E 4 151	RESIST R 150Ω	A7	
R 020	E 4 391	RESIST R 390Ω	A1	
RT001	RTSM021 104	T ERMIST R	C2	
U001	G450SER001	R GRAMME EE R M	A7	
U002	UM 0135	SRAM	A7	
U003	G450 001	R GRAMME LAS MEM R	6	
U004	711801	8 Mb MICR C TR LLER	A5	
U008	TCM4400	ASE A R I TER ACE	A3	
U009	R 5 L36AATR	IC	A2	
U014	R 5RG30AATR	LTAGE REGULAT R 3	A2	
U015	R 5RT50AATR	LTAGE REGULAT R 5	1	
U016	R 5 24AATR	RESET GE ERAT R 2 4	A2	
U017	URI 0022	REGULAT R 2 4	1	
U019	UAKL0004	IC UA -AM	A4	

10.3.2 RF

MODEL	E -G450	NAME			R	
Ref.	**Part No.**	**Description**			**Grid**	**Remarks**
	AS70011A	U ER L ER ASSEM L				
	G4570631A	ASSEM LE R C				
C100	GM2R105K1AT	CA ACIT R	1µ	10	A4	
C101	ECU 1 470 C	CA ACIT R	47p	50	6	
C102	ECU 1 470 C	CA ACIT R	47p	50	6	
C103	ECU 1 470 C	CA ACIT R	47p	50	2	
C109	ECU 1 470 C	CA ACIT R	47p	50	6	
C110	GM1C101 1 T	CA ACIT R	100p	50	A3	
C111	ECU 1 103K	CA ACIT R	10n	50	C6	
C112	GM1C101 1 T	CA ACIT R	100p	50	C6	
C113	GM1C101 1 T	CA ACIT R	100p	50	A2	
C114	GM1C101 1 T	CA ACIT R	100p	50	A2	
C115	GM1C101 1 T	CA ACIT R	100p	50	A2	
C116	GM1C101 1 T	CA ACIT R	100p	50	C6	
C119	GM1C101 1 T	CA ACIT R	100p	50	A2	
C120	GM1C101 1 T	CA ACIT R	100p	50	A2	
C121	ECU 1 390 C	CA ACIT R	39p	50	A2	
C122	ECU 1 103K	CA ACIT R	10n	50	A2	
C123	ECU 1 103K	CA ACIT R	10n	50	A2	
C124	ECU 1 470 C	CA ACIT R	47p	50	2	
C125	GM1C101 1 T	CA ACIT R	100p	50	A3	
C126	ECU 1 103K	CA ACIT R	10n	50	A3	
C127	GM1C101 1 T	CA ACIT R	100p	50	A3	
C128	GM1C101 1 T	CA ACIT R	100p	50	A3	
C129	GM1C101 1 T	CA ACIT R	100p	50	A3	
C130	GM1C101 1 T	CA ACIT R	100p	50	A3	
C133	GM1C101 1 T	CA ACIT R	100p	50	A3	

MODEL	E -G450	NAME			R	
Ref.	**Part No.**	**Description**			**Grid**	**Remarks**
C150	GM1C101 1 T	CA ACIT R	100p	50	A4	
C153	GM1C101 1 T	CA ACIT R	100p	50	A4	
C154	ECU 1 103K	CA ACIT R	10n	50	A5	
C155	GM1C101 1 T	CA ACIT R	100p	50	A4	
C157	GM1C101 1 T	CA ACIT R	100p	50	5	
C159	GM1C101 1 T	CA ACIT R	100p	50	5	
C160	GM1C101 1 T	CA ACIT R	100p	50	5	
C161	ECU 1 221 C	CA ACIT R	220p	50	2	
C162	ECU 1C333K	CA ACIT R	33n	16	2	
C163	ECU 1 040CC	CA ACIT R	4p	50	5	
C164	GM1C101 1 T	CA ACIT R	100p	50	5	
C166	ECU 1 271 C	CA ACIT R	270p	50	7	
C167	ECU 1 331 C	CA ACIT R	330p	50	7	
C168	ECU 1 103K	CA ACIT R	10n	50	7	
C169	GM1C101 1 T	CA ACIT R	100p	50	A3	
C172	GM1C161 1 T	CA ACIT R	160p	50	7	
C173	GM1C161 1 T	CA ACIT R	160p	50	7	
C174	ECU 1 331 C	CA ACIT R	330p	50	6	
C175	ECU 1 010CC	CA ACIT R	1p	50	C1	
C176	CS U012M106	CA ACIT R	10µ	16	A5	
C177	CS U012M106	CA ACIT R	10µ	16	A5	
C200	ECU 1 020CC	CA ACIT R	2p	50	A6	
C201	ECU 1 040CC	CA ACIT R	4p	50	A6	
C202	ECU 1 040CC	CA ACIT R	4p	50	A7	
C203	GM1C101 1 T	CA ACIT R	100p	50	A6	
C204	ECU 1 102K	CA ACIT R	1n	50	A6	
C205	GM1C101 1 T	CA ACIT R	100p	50	A6	
C206	ECU 1 103K	CA ACIT R	10n	50	A7	
C207	GM1C101 1 T	CA ACIT R	100p	50	A6	

MODEL	E -G450	NAME			R	
Ref.	Part No.	Description			Grid	Remarks
C208	ECU 1 030CC	CA ACIT R	3p	50	A7	
C210	GM1C101 1 T	CA ACIT R	100p	50	C2	
C211	ECU 1 102K	CA ACIT R	1n	50	C2	
C212	ECU 1 103K	CA ACIT R	10n	50	A6	
C213	ECU 1 102K	CA ACIT R	1n	50	A6	
C214	ECU 1 040CC	CA ACIT R	4p	50	A5	
C215	ECU 1 020CC	CA ACIT R	2p	50	A5	
C216	GM1C101 1 T	CA ACIT R	100p	50	C2	
C217	ECU 1 103K	CA ACIT R	10n	50	C2	
C218	ECU 1 103K	CA ACIT R	10n	50	A6	
C219	ECU 1 102K	CA ACIT R	1n	50	A4	
C220	ECU 1 030CC	CA ACIT R	3p	50	A4	
C221	ECU 1 100 C	CA ACIT R	10p	50	C2	
C222	GM1C101 1 T	CA ACIT R	100p	50	C2	
C224	GM1C101 1 T	CA ACIT R	100p	50	C2	
C225	GM1C101 1 T	CA ACIT R	100p	50	A6	
C226	GM1C101 1 T	CA ACIT R	100p	50	A6	
C227	ECU 1 050 C	CA ACIT R	5p	50	A6	
C228	ECU 1 050 C	CA ACIT R	5p	50	A6	
C229	ECU 1E223K	CA ACIT R	22n	25	C2	
C230	ECU 1E223K	CA ACIT R	22n	25	C2	
C231	ECU 1 030CC	CA ACIT R	3p	50	A6	
C232	GM1C101 1 T	CA ACIT R	100p	50	A6	
C233	ECU 1 103K	CA ACIT R	10n	50	A6	
C234	GM1C101 1 T	CA ACIT R	100p	50	A5	
C237	GM1C101 1 T	CA ACIT R	100p	50	A6	
C238	GM1C101 1 T	CA ACIT R	100p	50	A6	
C239	GM1C101 1 T	CA ACIT R	100p	50	A5	
C240	ECU 1 030CC	CA ACIT R	3p	50	A5	

MODEL	E -G450	NAME			R	
Ref.	Part No.	Description			Grid	Remarks
C250	ECU 1 070 C	CA ACIT R	7p	50	A6	
C251	ECU 1 070 C	CA ACIT R	7p	50	A5	
C252	ECU 1 070 C	CA ACIT R	7p	50	A5	
C253	ECU 1 070 C	CA ACIT R	7p	50	A5	
C254	ECU 1 331 C	CA ACIT R	330p	50	A6	
C255	ECU 1 331 C	CA ACIT R	330p	50	A5	
C301	CS U009M475	CA ACIT R	4 7µ	16	2	
C302	ECU 1 103K	CA ACIT R	10n	50	6	
C303	CS U011M156	CA ACIT R	15µ	6	2	
C304	GM1C101 1 T	CA ACIT R	100p	50	2	
C305	ECU 1 040CC	CA ACIT R	4p	50	1	
C306	ECU 1 102K	CA ACIT R	1n	50	2	
C307	ECU 1 103K	CA ACIT R	10n	50	2	
C308	ECU 1 103K	CA ACIT R	10n	50	1	
C309	ECU 1 103K	CA ACIT R	10n	50	2	
C310	ECU 1 561 C	CA ACIT R	560p	50	2	
C311	GM1C101 1 T	CA ACIT R	100p	50	C7	
C312	GM1C101 1 T	CA ACIT R	100p	50	C7	
C313	GM1C101 1 T	CA ACIT R	100p	50	A4	
C314	ECU 1 103K	CA ACIT R	10n	50	A4	
C315	GM1C101 1 T	CA ACIT R	100p	50	A4	
C316	ECU 1 271 C	CA ACIT R	270p	50	A4	
C317	ECU 1C473K	CA ACIT R	47n	16	A4	
C318	ECU 1 472K	CA ACIT R	4 7n	50	3	
C319	ECU 1C104K	CA ACIT R	100n	16	A4	
C320	GM1C101 1 T	CA ACIT R	100p	50	A4	
C321	GM1C101 1 T	CA ACIT R	100p	50	4	
C322	ECU 1 220 C	CA ACIT R	22p	50	A3	
C323	GM1C101 1 T	CA ACIT R	100p	50	A3	

MODEL	E -G450	NAME			R	
Ref.	Part No.	Description			Grid	Remarks
C325	GM1C101 1 T	CA ACIT R	100p	50	A3	
C326	GM1C101 1 T	CA ACIT R	100p	50	3	
C327	GM1C101 1 T	CA ACIT R	100p	50	2	
C328	ECU 1 102K	CA ACIT R	1n	50	A4	
C329	GM1C101 1 T	CA ACIT R	100p	50	3	
C330	CCSM028 106	CA ACIT R	10µ	10	A4	
C331	ECU 1C333K	CA ACIT R	33n	16	A3	
C332	ECU 1C104K	CA ACIT R	100n	16	A2	
C333	GM1C101 1 T	CA ACIT R	100p	50	A2	
C334	ECU 1 100 C	CA ACIT R	10p	50	A2	
C335	ECU 1 100 C	CA ACIT R	10p	50	A2	
C336	GM1C101 1 T	CA ACIT R	100p	50	A2	
C337	ECU 1 102K	CA ACIT R	1n	50	A2	
C339	ECU 1 100 C	CA ACIT R	10p	50	A2	
C340	ECU 1 080 C	CA ACIT R	8p	50	A2	
C341	ECU 1 030CC	CA ACIT R	3p	50	A2	
C342	ECU 1 103K	CA ACIT R	10n	50	2	
C343	TA A685M006R	CA ACIT R	6 8u	6 3	2	
C344	GM1C101 1 T	CA ACIT R	100p	50	A2	
C345	ECU 1 102K	CA ACIT R	1n	50	2	
C346	GM1C101 1 T	CA ACIT R	100p	50	A2	
C347	ECU 1C104K	CA ACIT R	100n	16	A2	
C348	GM1C101 1 T	CA ACIT R	100p	50v	A2	
C349	ECU 1 100 C	CA ACIT R	10p	50	2	
C351	ECU 1C333K	CA ACIT R	33n	16	A2	
C353	ECU 1 050 C	CA ACIT R	5p	50	A3	
C370	CS U009M475	CA ACIT R	4 7µ	16	2	
C371	ECU 1 103K	CA ACIT R	10n	50	2	
C372	CS U011M106	CA ACIT R	10u	6 3	2	

MODEL	E -G450	NAME			R	
Ref.	Part No.	Description			Grid	Remarks
C373	ECU 1 103K	CA ACIT R	10n	50	2	
C374	CS U011M106	CA ACIT R	10u	6 3	2	
C375	GM1C101 1 T	CA ACIT R	100p	50	2	
C377	GM1 105 1AT	CA ACIT R	1µ	10	3	
C378	ECU 1 102K	CA ACIT R	1n	50	3	
C379	GM1C820 1 T	CA ACIT R	82p	50	3	
C381	GM1C101 1 T	CA ACIT R	100p	50	2	
C383	ECU 1 470 C	CA ACIT R	47p	50	1	
C393	GM1C101 1 T	CA ACIT R	100p	50	7	
C397	GM1C101 1 T	CA ACIT R	100p	50	1	
C403	ECU 1 010CC	CA ACIT R	1p	50	2	
C406	GM1C101 1 T	CA ACIT R	100p	50	2	
C407	ECU 1C104K	CA ACIT R	100n	16	3	
C408	GM1CR82C1 T	CA ACIT R	0 82p	50	2	
C500	GM1C120 1 T	CA ACIT R	12p	50	5	
C502	GM1C101 1 T	CA ACIT R	100p	50	7	
C503	ECU 1 221 C	CA ACIT R	220p	50	A1	
C504	ECU 1 221 C	CA ACIT R	220p	50	A1	
101	SMS2805L31	I E			5	
301	MA376T	I E			A2	
302	MA77T	I E			A2	
371	MA738T	I E			C7	
401	MA111T	I E			3	
E150	E 1556	IRECTI AL C U LER			5	
L101	E C 902MMT 4	SA ILTER			A4	
L102	E C 902MMT 4	SA ILTER			A4	

MODEL	E -G450	NAME	R	
Ref.	**Part No.**	**Description**	**Grid**	**Remarks**
L103	LSM00023	U LE ER	6	
L201	E C 947MM 6	SA ILTER	A6	
L202	E C 201M 1	SA ILTER	A5	
0002	A 00106	C ECT R 50 A	3	
0003	S70004A	SIM L ER	5	
0004	522050690	C ECT R 6 A	7	
001	A70024C	I C ECT R	A7	
L0001	E 1616	ALU SM 5 I	A3	
L100	EL RE4 7 2	I UCT R 4n7	A2	
L101	EL RE39 2	I UCT R 39n	A2	
L102	EL RE6 8 2	I UCT R 6n8	A2	
L103	EL RE6 8 2	I UCT R 6n8	A2	
L104	EL RE12 2	I UCT R 12n	A3	
L150	EL RE47 2	I UCT R 47n	A5	
L151	EL RE15 2	I UCT R 15n	5	
L155	EL RE3 3 2	I UCT R 3n3	A4	
L201	EL RE5 6 2	I UCT R 5n6	A7	
L202	EL RE5 6 2	I UCT R 5n6	A6	
L203	EL RE18 2	I UCT R 18n	A6	
L209	EL RE68 G 3	I UCT R 68n	A6	
L210	EL RE68 G 3	I UCT R 68n	A6	
L211	EL RE3 3 2	I UCT R 3n3	A4	
L213	LL2012 82	I UCT R 82n	A5	
L217	LK2125R15KT	I UCT R 150n	A6	
L218	LL2012 R12K	I UCT R 120n	A6	
L219	LL2012 R10	I UCT R 100n	A6	
L301	EL RE8 2 2	I UCT R 8n2	A4	

MODEL	E -G450	NAME	R	
Ref.	**Part No.**	**Description**	**Grid**	**Remarks**
L302	EL RE4 7 2	I UCT R 4n7	A2	
L303	EL RE5 6 2	I UCT R 5n6	A2	
L304	EL RE56 3	I UCT R 56n	A2	
L305	EL RE47 2	I UCT R 47n	A3	
L403	EL RE22 2	I UCT R 22n	A6	
150	UMC2TR	TRA SIST R	7	
301	2SC4617TLR	TRA SIST R	2	
304	2SC4226T1 01	TRA SIST R	A2	
305	TC144EETL	TRA SIST R	A2	
373	UMC5TR	TRA SIST R	2	
402	2S 1424T100R	TRA SIST R	C7	
403	C 67A	TRA SIST R	C7	
404	UMG2TR	TRA SIST R	7	
500	UMC2TR	TRA SIST R	A3	
R100	ER 3GE 100	RESIST R 10Ω	A4	
R103	ER 3GE 103	RESIST R 10kΩ	A1	
R104	ER 3GE 103	RESIST R 10kΩ	A1	
R105	ER 3GE 103	RESIST R 10kΩ	A1	
R106	ER 3GE 103	RESIST R 10kΩ	A1	
R107	ER 3GE 272	RESIST R 2k7Ω	A1	
R113	ER 3GE 272	RESIST R 2k7Ω	A1	
R115	ER 3GE 222	RESIST R 2k2Ω	C6	
R116	ER 3GE 151	RESIST R 150ΩΩ	C6	
R117	ER 3GE 0R00	RESIST R 0ΩΩ	A2	
R118	ER 3GE 0R00	RESIST R 0Ω	A2	
R119	ER 3GE 0R00	RESIST R 0Ω	A3	

MODEL	E -G450	NAME		R	
Ref.	Part No.	Description		Grid	Remarks
R120	ER 3GE 331	RESIST R	330Ω	A3	
R121	ER 3GE 222	RESIST R	2k2Ω	A3	
R122	ER 3GE 222	RESIST R	2k2Ω	A3	
R125	ER 3GE 560	RESIST R	56Ω	A3	
R126	ER 3GE 121	RESIST R	120Ω	A3	
R127	ER 3GE 0R00	RESIST R	0Ω	A3	
R128	ER 3GE 471	RESIST R	470Ω	A3	
R150	ER 3GE 120	RESIST R	12Ω	A4	
R151	ER 3GE 221	RESIST R	220Ω	4	
R152	ER 3GE 220	RESIST R	22Ω	A4	
R153	ER 3GE 221	RESIST R	220Ω	4	
R154	ER 3GE 221	RESIST R	220Ω	5	
R155	ER 3GE 122	RESIST R	1k2Ω	2	
R156	ER 3GE 392	RESIST R	3k9Ω	2	
R157	ER 3GE 562	RESIST R	5k6Ω	5	
R158	ER 3GE 392	RESIST R	3k9Ω	5	
R160	ER 3GE 332	RESIST R	3k3Ω	7	
R161	ER 3GE 153	RESIST R	15kΩ	7	
R163	ER 3GE 103	RESIST R	10kΩ	7	
R164	ER 3GE 103	RESIST R	10kΩ	7	
R165	ER 3GE 103	RESIST R	10kΩ	7	
R166	ER 3GE 183	RESIST R	18kΩ	7	
R167	ER 3GE 102	RESIST R	1kΩ	7	
R202	ER 3GE 121	RESIST R	120Ω	A6	
R203	ER 3GE 470	RESIST R	47Ω	A5	
R204	ER 3GE 102	RESIST R	1kΩ	A5	
R205	ER 3GE 102	RESIST R	1kΩ	A6	
R250	ER 3GE 152	RESIST R	1k5Ω	A5	

MODEL	E -G450	NAME		R	
Ref.	Part No.	Description		Grid	Remarks
R251	ER 3GE 683	RESIST R	68kΩ	A6	
R252	ER 3GE 683	RESIST R	68kΩ	A5	
R253	ER 3GE 242	RESIST R	2k4Ω	A5	
R254	ER 3GE 152	RESIST R	1k5Ω	A5	
R255	ER 3GE 242	RESIST R	2k4Ω	A5	
R256	ER 3GE 683	RESIST R	68kΩ	A5	
R257	ER 3GE 683	RESIST R	68kΩ	A5	
R258	ER 3GE 242	RESIST R	2k4Ω	A5	
R259	ER 3GE 152	RESIST R	1k5Ω	A5	
R260	ER 3GE 303	RESIST R	30kΩ	A5	
R261	ER 3GE 303	RESIST R	30kΩ	A5	
R262	ER 3GE 303	RESIST R	30kΩ	A5	
R263	ER 3GE 303	RESIST R	30kΩ	A6	
R264	ER 3GE 242	RESIST R	2k4Ω	A6	
R265	ER 3GE 152	RESIST R	1k5Ω	A6	
R301	ER 3GE 102	RESIST R	1kΩ	2	
R302	ER 3GE 152	RESIST R	1k5Ω	2	
R303	ER 3GE 153	RESIST R	15kΩ	2	
R304	ER 3GE 682	RESIST R	6k8Ω	2	
R305	ER 3GE 561	RESIST R	560Ω	2	
R308	ER 3GE 150	RESIST R	15Ω	A4	
R309	ER 3GE 821	RESIST R	820Ω	A4	
R310	ER 3GE 123	RESIST R	12kΩ	A4	
R311	ER 3GE 472	RESIST R	4k7Ω	A4	
R312	ER 3GE 150	RESIST R	15Ω	A4	
R313	ER 3GE 150	RESIST R	15Ω	A4	
R314	ER 3GE 150	RESIST R	15Ω	3	
R316	ER 3GE 103	RESIST R	10kΩ	A4	

MODEL	E -G450	NAME		R	
Ref.	**Part No.**	**Description**		**Grid**	**Remarks**
R317	ER 3GE 151	RESIST R	150Ω	A2	
R318	ER 3GE 822	RESIST R	8k2Ω	A2	
R319	ER 3GE 472	RESIST R	4k7Ω	A2	
R320	ER 3GE 392	RESIST R	3k9Ω	A2	
R321	ER 3GE 562	RESIST R	5k6Ω	A2	
R322	ER 3GE 392	RESIST R	3k9Ω	A2	
R323	ER 3GE 121	RESIST R	120Ω	A2	
R324	ER 3GE 101	RESIST R	100Ω	2	
R326	ER 3GE 0R00	RESIST R	0Ω	A2	
R327	ER 3GE 270	RESIST R	27Ω	A3	
R328	ER 3GE 181	RESIST R	180Ω	A3	
R329	ER 3GE 0R00	RESIST R	0Ω	3	
R330	ER 3GE 102	RESIST R	1kΩ	3	
R331	ER 3GE 102	RESIST R	1kΩ	A3	
R332	ER 3GE 102	RESIST R	1kΩ	3	
R333	ER 3GE 104	RESIST R	100kΩ	3	
R334	ER 3GE 104	RESIST R	100kΩ	3	
R335	ER 3GE 104	RESIST R	100kΩ	3	
R337	ER 3GE 0R00	RESIST R	0Ω	3	
R338	ER 3GE 393	RESIST R	39kΩ	A2	
R339	ER 3GE 392	RESIST R	3k9Ω	A2	
R370	ER 6GE 471	RESIST R	470Ω	C7	
R371	ER 3GE 471	RESIST R	470Ω	C7	
R407	ER 3GE 0R00	RESIST R	0Ω	A4	
R408	ER 3GE 330	RESIST R	33Ω	A4	
R413	ER 3GE 682	RESIST R	6k8Ω	A5	
R414	ER 3GE 682	RESIST R	6k8Ω	A5	
R415	ER 3GE 682	RESIST R	6k8Ω	A5	

MODEL	E -G450	NAME		R	
Ref.	**Part No.**	**Description**		**Grid**	**Remarks**
R416	ER 3GE 682	RESIST R	6k8Ω	A6	
R417	ER 3GE 684	RESIST R	680kΩ	A5	
R418	ER 3GE 684	RESIST R	680kΩ	A5	
R419	ER 3GE 684	RESIST R	680kΩ	A5	
R420	ER 3GE 684	RESIST R	680kΩ	A6	
R421	ER 3GE 0R00	RESIST R	0Ω	A2	
R422	ER 3GE 270	RESIST R	27Ω	7	
R423	ER 3GE 103	RESIST R	10kΩ	7	
R425	ER 3GE 104	RESIST R	100kΩ	C7	
R502	ER 3GE 0R00	RESIST R	0Ω	A4	
R503	ER 3GE 0R00	RESIST R	0Ω	3	
R 401	E 4 103	RESIST R	10kΩ	C7	
U103	M 2240	IC		A2	
U104	0145MT	A M ULE		4	
U105	MC33072	- AM S		7	
U106	U C2771TE3	TRA SIST R		A4	
U201	U G 0002	IC		A6	
U301	TK11236 MCL	REGULAT R	3 6	2	
U302	E 3222A	TC C		1	
U303	E 1 3S72	C		A4	
U304	UAL 0008	AM		A4	
U305	U I0005	IC		A3	
U306	UAL 0008	AM		A2	
U370	TK11236 MCL	REGULAT R	3 6	2	
U371	TK11236 MCL	REGULAT R	3 6	2	

10.3.3 Mechanical

MODEL	E -G450	NAME	Mechanical	
Ref.	**Part No.**	**Description**	**Grid**	**Remarks**
	9R4500K	RE UR KIT - LACK		
	9R4500M	RE UR KIT - METALLIC LUE		
A0101	AA70050A	LC M ULE		
E0151	A 70073A	I E A TE A		
M0101	G450C AS01K	C ER ASS - LACK		
M0101	G450C AS01M	C ER ASS - METALLIC LUE		
M0102	5 70086 A	LC A EL		
M0105	5 70115AA	KE S EET		
M0106	5 70018A	MIC US I G		
M0109	5S70074A	LC ACKLIG T		
M0110	5 70058	C ASSIS		
M0111	5K70070A	A TE A TU E		
M0112	4G70003A	A TE A L ER		
M0113	5M70149A	CASE		
M0115	1 70188A	A TE A TERMI AL		
M0123	G5M S002	ATE T LA EL		
M116	3 70027A	SCRE		
M117	3 70027A	SCRE		
M124	3 70027A	SCRE		
M125	3 70027A	SCRE		
MK0107	M70011A	MICR E ASS		
R	70057	C -A CA LE		

MODEL	E -G450	NAME	Mechanical	
Ref.	**Part No.**	**Description**	**Grid**	**Remarks**
M K001	6C72546A	UTER CART		
M K002	6 70571A	UL CUS I		
M K003	6 70572A	CAR AR CUS I		

10.4 Handsfree Replacement Parts List

10.4.1 Handsfree Unit

MODEL	E - 501 E - 450	NAME	an s ree Unit	
Ref	**Part No.**	**Description**	**Grid**	**Remarks**
C0101	ECA1 330	CA ACIT R 1µF 50		
C0102	EEU A1 121E	CA ACIT R 1µF 50		
C0103	ECA1C 121	CA ACIT R 120n 16		
C0104	ECA1C 121	CA ACIT R 120n 16		
C0105	ECEA0 KG330	CA ACIT R 1µF 6 3		
C0106	GM2 103K1 T	CA ACIT R 10n 50		
C0107	GM2 103K1 T	CA ACIT R 10n 50		
C0108	GM2 103K1 T	CA ACIT R 10n 50		
C0111	GM2 104 1 T	CA ACIT R 100n 50		
C0112	GM2 104 1 T	CA ACIT R 100n 50		
C0113	GM2 104 1 T	CA ACIT R 100n 50		
C0114	GM2 104K1ET	CA ACIT R 0 1µ 25		
C0115	GM2 104K1ET	CA ACIT R 0 1µ 25		
C0116	GM2 102K1 T	CA ACIT R 1n 50		
C0117	GM2 103K1 T	CA ACIT R 10n 50		
C0118	GM2 103K1 T	CA ACIT R 10n 50		
C0120	GM2 104 1 T	CA ACIT R 100n 50		
C0201	ECEA1EGE331	CA ACIT R 330µ 25		
C0202	GM1 103K1 T	CA ACIT R 10n 50		

MODEL	E - 501 E - 450	NAME			an s ree Unit	
Ref	Part No.	Description			Grid	Remarks
C0301	ECE 1CG100GR	CA ACIT R	10µ	16		
C0302	ECU 1 472K	CA ACIT R	0 47µ	50		
C0304	GM1 104K1CT	CA ACIT R	0 1µ	25		
C0305	ECE 1 G010GR	CA ACIT R	1µ	50		
C0306	GM1 222K1 T	CA ACIT R	2 2n	50		
C0307	GM1 821K1 T	CA ACIT R	820p	50		
C0308	ECE 1CG100GR	CA ACIT R	10µ	16		
C0309	ECE 1 G010GR	CA ACIT R	1µ	50		
C0310	GM1C101 1 T	CA ACIT R	100p	50		
C0311	GM1C101 1 T	CA ACIT R	100p	50		
C0312	GM1C101 1 T	CA ACIT R	100p	50		
C0313	GM1 103K1 T	CA ACIT R	0 01µ	50		
C0314	GM1 103K1 T	CA ACIT R	0 01µ	50		
C0315	GM1 332K1 T	CA ACIT R	3 3n	50		
C0316	GM1 332K1 T	CA ACIT R	3 3n	50		
C0317	ECE 1CG100GR	CA ACIT R	10µ	16		
C0318	GM1 104K1CT	CA ACIT R	0 1µ	25		
C0319	GM2 474K1CT	CA ACIT R	0 47µ	25		
C0325	GM1C101 1 T	CA ACIT R	100p	50		
C0326	GM1 104K1CT	CA ACIT R	0 1µ	25		
C0327	GM1 102K1 T	CA ACIT R	1n	50		
C0328	ECE 1 GR33GR	CA ACIT R	0 33µ	50		
C0329	GM1 104K1CT	CA ACIT R	0 1µ	25		
C0340	ECE 1CG100GR	CA ACIT R	10µ	16		
C0341	GM1 104K1CT	CA ACIT R	0 1µ	25		
C0342	ECE 1CG100GR	CA ACIT R	10µ	16		
C0343	GM1 104K1CT	CA ACIT R	0 1µ	25		
C0344	GM1 104K1CT	CA ACIT R	0 1µ	25		

MODEL	E - 501 E - 450	NAME			an s ree Unit	
Ref	Part No.	Description			Grid	Remarks
C0345	GM1 104K1CT	CA ACIT R	0 1µ	25		
C0346	GM1 104K1CT	CA ACIT R	0 1µ	25		
C0347	GM1 104K1CT	CA ACIT R	0 1µ	25		
C0348	ECE 1CG100GR	CA ACIT R	10µ	16		
C0349	GM1 102K1 T	CA ACIT R	1n	50		
C0351	GM1C100 1 T	CA ACIT R	10p	50		
C0352	GM1C100 1 T	CA ACIT R	10p	50		
C0353	ECE 1CG100GR	CA ACIT R	10µ	16		
C0355	GM1 104K1CT	CA ACIT R	0 1µ	25		
C0356	GM1 183K1CT	CA ACIT R	0 01µ	16		
C0357	ECE 1 G010GR	CA ACIT R	1µ	50		
C0358	ECE 0 G220GR	CA ACIT R	22µ	6 3		
C0359	GM2 104 1 T	CA ACIT R	100n	50		
C0360	ECEA1EGE221	CA ACIT R	220µ	25		
C0361	ECEA1EGE221	CA ACIT R	220µ	25		
C0362	GM1 104K1CT	CA ACIT R	0 1µ	25		
C0363	GM1C220 1 T	CA ACIT R	22p	50		
C0364	GM1C220 1 T	CA ACIT R	22p	50		
C0365	GM1C220 1 T	CA ACIT R	22p	50		
C0366	GM1C220 1 T	CA ACIT R	22p	50		
C0367	GM1C220 1 T	CA ACIT R	22p	50		
C0368	GM1C220 1 T	CA ACIT R	22p	50		
C0369	GM2 474K1CT	CA ACIT R	0 47µ	25		
C0371	GM1C220 1 T	CA ACIT R	22p	50		
C0372	GM2 474K1CT	CA ACIT R	0 47µ	25		
C0373	GM2 474K1CT	CA ACIT R	0 47µ	25		
C0374	GM1C101 1 T	CA ACIT R	100p	50		
C0375	GM1C101 1 T	CA ACIT R	100p	50		

MODEL	E - 501 E - 450	NAME	an s ree Unit	
Ref	Part No.	Description	Grid	Remarks
C0376	GM1C220 1 T	CA ACIT R 22p 50		
C0377	GM1C101 1 T	CA ACIT R 100p 50		
C0378	GM1 104K1CT	CA ACIT R 0 1µ 16		
C0379	GM1 104K1CT	CA ACIT R 0 1µ 16		
C0380	GM1C101 1 T	CA ACIT R 100p 50		
0103	S 64	I E		
0104	S 64	I E		
0107	MA7100ATR	I E		
0201	RM3L 014102	I E		
0202	MA8160MT	E ER I E		
0204	MA8120T	I E		
0205	MA8330T	I E		
0206	MA132ΩKT	I E		
0207	MA8330T	I E		
0300	MA8120T	I E		
0301	MA8120T	I E		
0303	MA8120T	I E		
0304	MA8120T	I E		
0305	MA8120T	I E		
0311	MA732T	I E		
0312	MA8120T	I E		
0101	U25	USE 2 5A		
L0101	L02R 1R62	CTAL US R		
0300	S 1080110	ILTER		

MODEL	E - 501 E - 450	NAME	an s ree Unit	
Ref	Part No.	Description	Grid	Remarks
L0101	RC 664470K	I UCT R 47µ 12M		
L0102	RCR110 221L	I UCT R 220µ 3 1M		
L0103	RC 664470K	I UCT R 47µ 12M		
LS0301	S45U0208	S EAKER		
0201	L 2016 T1 1	LUG 16 A 3A		
0202	A70028A	C ECT R		
0203	116 2 SA	C ECT R 6 A		
0300	A S00218	C ECT R		
0301	533980290	C ECT R		
0101	2S 1142RS	TRA SIST R		
0102	2S 1835ST	TRA SIST R		
0107	2S 601A ST	TRA SIST R		
0201	TC144EUT	TRA SIST R		
0202	TA144EUT	TRA SIST R		
0203	TC114EUT	TRA SIST R		
0204	2S 931 R	TRA SIST R		
0205	2S 1755 T	TRA SIST R		
0305	TA144EUT	TRA SIST R		
0306	2S 602AT	TRA SIST R		
0307	TA144EUT	TRA SIST R		
0308	TC144EUT	TRA SIST R		
0309	2S 874A ST	TRA SIST R		
R0101	ER 1SGR68U	RESIST R 0 68Ω		
R0102	E M7LS 00 53	RESIST R 5kΩ		
R0103	ER 3GE 334	RESIST R 330kΩ		

MODEL	E - 501 E - 450	NAME	an s ree Unit	
Ref	**Part No.**	**Description**	**Grid**	**Remarks**
R0111	ER 3GE 102	RESIST R 1kΩ		
R0112	ER 3GE 102	RESIST R 1kΩ		
R0113	ER 6GE 390	RESIST R 30Ω		
R0114	ER 6GE 390	RESIST R 30Ω		
R0115	ER 6GE 390	RESIST R 30Ω		
R0116	ER 3GE 473	RESIST R 47kΩ		
R0117	ER 3GE 102	RESIST R 1kΩ		
R0118	ER 3GE 223	RESIST R 22kΩ		
R0119	RR1220 103	RESIST R 10kΩ		
R0120	RR1220 103	RESIST R 10kΩ		
R0121	RR1220 123	RESIST R 12kΩ		
R0122	RR1220 103	RESIST R 10kΩ		
R0123	RR1220 103	RESIST R 10kΩ		
R0124	ER 3GE 472	RESIST R 4 7kΩ		
R0125	ER 3GE 334	RESIST R 330kΩ		
R0127	RR1220 243	RESIST R 24kΩ		
R0128	RR1220 242	RESIST R 2k4Ω		
R0130	RR1220 103	RESIST R 10kΩ		
R0131	RR1220 183	RESIST R 18kΩ		
R0132	RR1220 122	RESIST R 10kΩ		
R0133	RR1220 683	RESIST R 68kΩ		
R0134	RR1220 153	RESIST R 15kΩ		
R0135	RR1220 153	RESIST R 15kΩ		
R0144	E M7LS 00 14	RESIST R 10KΩ		
R0201	ER 3GE 104	RESIST R 100kΩ		
R0202	ER 3GE 103	RESIST R 10kΩ		
R0203	ER 3GE 221	RESIST R 220Ω		

MODEL	E - 501 E - 450	NAME	an s ree Unit	
Ref	**Part No.**	**Description**	**Grid**	**Remarks**
R0204	ER 3GE 471	RESIST R 470Ω		
R0205	ER 12 102	RESIST R 1kΩ		
R0206	ER 12 102	RESIST R 1kΩ		
R0207	ER 3GE 103	RESIST R 10kΩ		
R0208	ER 3GE 222	RESIST R 2 2kΩ		
R0301	ER 3GE 392	RESIST R 3 9kΩ		
R0302	ER 3GE 681	RESIST R 680Ω		
R0303	ER 3GE 104	RESIST R 100kΩ		
R0304	ER 3GE 223	RESIST R 22kΩ		
R0305	ER 3GE 472	RESIST R 4 7kΩ		
R0306	ER 3GE 472	RESIST R 4 7kΩ		
R0307	ER 3GE 472	RESIST R 4 7kΩ		
R0308	ER 3GE 103	RESIST R 10kΩ		
R0309	ER 3GE 104	RESIST R 100kΩ		
R0310	ER 3GE 104	RESIST R 100kΩ		
R0311	ER 3GE 103	RESIST R 10kΩ		
R0312	ER 3GE 471	RESIST R 470Ω		
R0313	ER 3GE 101	RESIST R 100Ω		
R0315	ER 3GE 104	RESIST R 100kΩ		
R0316	ER 3GE 104	RESIST R 100kΩ		
R0317	ER 3GE 101	RESIST R 100Ω		
R0318	ER 3GE 101	RESIST R 100Ω		
R0319	ER 3GE 103	RESIST R 10kΩ		
R0320	ER 3GE 103	RESIST R 10kΩ		
R0321	ER 3GE 103	RESIST R 10kΩ		
R0322	ER 3GE 103	RESIST R 10kΩ		
R0323	ER 3GE 102	RESIST R 1kΩ		

MODEL	E - 501 E - 450	NAME	an s ree Unit	
Ref	Part No.	Description	Grid	Remarks
R0324	E U 2A 15 54	RESIST R 50kΩ		
R0325	ER 3GE 682	RESIST R 6 8kΩ		
R0328	ER 3GE 101	RESIST R 100Ω		
R0330	ER 3GE 824	RESIST R 820kΩ		
R0331	ER 3GE 153	RESIST R 15kΩ		
R0332	ER 3GE 563	RESIST R 56kΩ		
R0333	ER 3GE 104	RESIST R 100kΩ		
R0334	ER 3GE 104	RESIST R 100kΩ		
R0335	ER 3GE 222	RESIST R 2 2kΩ		
R0336	ER 3GE 563	RESIST R 56kΩ		
R0337	ER 3GE 683	RESIST R 68kΩ		
R0338	ER 3GE 333	RESIST R 33kΩ		
R0339	ER 3GE 222	RESIST R 2 2kΩ		
R0340	ER 3GE 103	RESIST R 10kΩ		
R0341	ER 3GE 103	RESIST R 10kΩ		
R0345	ER 3GE 0R00	RESIST R 0Ω		
R0346	ER 3GE 0R00	RESIST R 0Ω		
R0348	ER 3GE 473	RESIST R 47kΩ		
R0349	ER 3GE 472	RESIST R 4 7kΩ		
R0351	ER 3GE 105	RESIST R 1MΩ		
R0352	ER 3GE 104	RESIST R 100kΩ		
R0353	ER 3GE 682	RESIST R 6 8kΩ		
R0354	ER 3GE 104	RESIST R 100kΩ		
R0355	ER 3GE 104	RESIST R 100kΩ		
R0356	ER 3GE 0R00	RESIST R 0Ω		
R0357	ER 3GE 104	RESIST R 100kΩ		
R0358	ER 3GE 223	RESIST R 22kΩ		

MODEL	E - 501 E - 450	NAME	an s ree Unit	
Ref	Part No.	Description	Grid	Remarks
R0359	ER 3GE 682	RESIST R 6 8kΩ		
R0360	ER 6GE 100	RESIST R 10Ω		
R0361	ER 6GE 471	RESIST R 470Ω		
R0362	ER 6GE 2R2	RESIST R 2 2Ω		
R0363	ER 3GE 473	RESIST R 47kΩ		
R0364	ER 3GE 223	RESIST R 22kΩ		
R0365	ER 3GE 103	RESIST R 10kΩ		
R0366	ER 3GE 103	RESIST R 10kΩ		
R0367	ER 3GE 472	RESIST R 4 7kΩ		
R0369	ER 3GE 102	RESIST R 1kΩ		
R0373	ER 3GE 473	RESIST R 47kΩ		
R0374	ER 3GE 473	RESIST R 47kΩ		
R0375	ER 3GE 473	RESIST R 47kΩ		
R0376	ER 3GE 473	RESIST R 47kΩ		
R0377	ER 3GE 562	RESIST R 5 6kΩ		
R0378	ER 3GE 103	RESIST R 10kΩ		
R0379	ER 3GE 103	RESIST R 10kΩ		
U0101	U C494GSE2	IC		
U0102	M3404AMT1	IC		
U0301	M3404AMT1	IC		
U0302	UR 0002	REGULAT R		
U0303	UR 0002	REGULAT R		
U0304	ULCS0003	IC		
U0305	ULCS0003	IC		
U0306	ULCS0004	IC		
U0308	T A2003	IC		
U0309	M2072MTE1	IC		

MODEL	E - 501 E - 450	NAME	an s ree Unit	
Ref	**Part No.**	**Description**	**Grid**	**Remarks**
U0310	U 74 C123G	IC		
U0311	M2107 TE1	IC		
U0312	SC14S66 EL	A AL GUE S ITC		
U0313	SC14S66 EL	A AL GUE S ITC		
U0314	R 5 L45AATL	REGULAT R		
U0315	M2107 TE1	IC		
0001	70005A	ER SU L CA LE		
0201	C70109A	CURL C R		
0202	C70110A	I TERC ECTI G CA LE		
0301	C70152A	S EAKER CA LE		
0302	G70003A	E TER AL MIC CA LE		
0301	CM30918M	CR STAL		

10.4.2 Mechanical

MODEL	E - 501 E - 450	NAME	Mechanical	
Ref.	**Part No.**	**Description**	**Grid**	**Remarks**
M0401	5 70086A	A S REE C ER		
M0402	6 10031A	S EAKER ET		
M0403	4R8209	S EAKER ACKI G		
M0404	1 70071A	S EAKER RACKET		
M0405	T 256G	SCRE		
M0406	T 256G	SCRE		
M0410	5M70076A	A S REE CASE		
M0411	1 C5819A	LATE		
M0412	7 70119A	A S REE AME LATE		

MODEL	E - 501 E - 450	NAME	Mechanical	
Ref.	**Part No.**	**Description**	**Grid**	**Remarks**
M0413	S 35	SCRE		
M0420	1C70128A	S IEL CASE 1		
M0421	1C70129A	S IEL CASE 2		
M0422	1E70008A	RA IAT R		
M0423	5G10500A	I SULAT R		
M0424	1M270900102	CLAM		
M0425	5 5129A	LUME K		
M0426	3 6	SCRE		
M0427	T 2510G	SCRE		
M0428	T 2510G	SCRE		
M0429	T 256G	SCRE		
M0440	3 30	SCRE		
M0441	5U70008	T C ER		

10.4.3 Holder

MODEL	E -KA500	NAME	ol er	
Ref.	**Part No.**	**Description**	**Grid**	**Remarks**
M0501	5M70115A	L ER CASE		
M0502	M6 6 12	MAG ET		
M0503	4 70016A	K S RI G		
M0504	5 70066A	K		
M0505	T 256G	SCRE		
M0506	T 256G	SCRE		
M0507	T 256G	SCRE		
M0508	5U70049	L ER CUS I 1		
M0509	7 70164A	L ER AME LATE		
M0510	7 70120A	L ER CAUTI LA EL		

10.4.4 Microphone

MODEL	E M1177	NAME	Microphone	
Ref.	**Part No.**	**Description**	**Grid**	**Remarks**
M0101	4G31674	MIC L ER		
M0102	4G32105	MIC L ER		
M0103	4R13358	MIC CUS I		
M0104	7C10096A	MIC AME LATE		
M0105	7C10096A	MIC AME LATE		
M0107	T 2510A	SCRE		
MK0101	M4108	MICR E		

10.4.5 Adjustable Angle Bracket 1

MODEL	E 0001	NAME	A ustable Angle racket	
Ref.	art o	**Description**	**Grid**	**Remarks**
M0701	3G24152	RACKET		
M0702	G4 8	SCRE		
M0703	A4 K	S RI G AS ER		
M0704	G4 K	AS ER		
M0705	G4 8	SCRE		
M0706	A4 K	S RI G AS ER		
M0707	G4 K	AS ER		
M0708	3G24157	RACKET		
M0709	S 410 K	SCRE		
M0710	S 410 K	SCRE		
M0711	S 410 K	SCRE		
M0712	S 410 K	SCRE		
M0713	T 425R K	SCRE		
M0714	T 425R K	SCRE		
M0715	T 425R K	SCRE		
M0716	T 425R K	SCRE		

10.4.6 Adjustable Angle Bracket 2

MODEL	E 0002	NAME	A ustable Angle racket	
Ref.	**Part No.**	**Description**	**Grid**	**Remarks**
M0701	3G24152	RACKET		
M0702	G4 8	SCRE		
M0703	A4 K	S RI G AS ER		
M0704	G4 K	AS ER		
M0705	G4 8	SCRE		
M0706	A4 K	S RI G AS ER		
M0707	G4 K	AS ER		
M0708	3G24157	RACKET		
M0709	S 410 K	SCRE		
M0710	S 410 K	SCRE		
M0711	S 410 K	SCRE		
M0712	S 410 K	SCRE		
M0713	T 425R K	SCRE		
M0714	T 425R K	SCRE		
M0715	T 425R K	SCRE		
M0716	T 425R K	SCRE		
M0718	G4A K	UT		
M0719	G4A K	UT		
M0720	G4A K	UT		
M0721	G4A K	UT		

10.5 Printed Material

art nu bers or ocu entation are sho n on page 2-7 2 General In or ation 2 11 ocu entation

10.6 Dual Charger

The ual Charger is not a serviceable ite

10.7 DC Adaptor

The C A aptor is not a serviceable ite

10.8 PC Card

MODEL	E - A500	**NAME**	C Car	
Ref.	**Part No.**	**Description**	**Grid**	**Remarks**
		I TER ACE CAR		